SUN DIET

or

LIVE FOOD FOR LIVE BRITONS

By

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AUTHOR'S NOTE

THIS book is written for every man and woman by one who has dealt in general and hospital practice with all classes.

The author makes no claim to be either a scientist or an original investigator.

Accepted historical facts and scientific data are quoted for the purpose of obtaining a bird's-eye view of the subject, sufficiently wide to lead to a depth of understanding which may result in confident action.

Many of these facts and data can be found in the reports of the Medical Research Council, of the League of Nations, in the Press, and periodicals and elsewhere.

Most of them come under the heading, "General Knowledge."

As far as possible authorities, when quoted, are expressly named.

Writing from the clinical standpoint, the author wishes to make the fullest acknowledgment to any unnamed specialists whose observations he may have absorbed during a working life and have used in this volume without specific recognition.

T. H. S.-W.

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FOREWORD

THE subject of physical fitness has become of supreme interest to the British race. The Government of the United Kingdom and innumerable learned philanthropic societies within its boundaries are endeavouring to re-make an A 1 nation. Various methods are advocated.

Forty years in hospitals and general practice have convinced the Author that stature, vitality and fitness depend on food, and that much of the disease now dealt with by clinics and social services would disappear if food were recognized to be what it is, the foundation of health, and the first and fundamental problem of life.

Every day, every man labours to meet the costs of the family food requirements. Each morning, every woman decides how best, with the means at command, to combine the acme of food value with diversities of needs. Modern methods force her to do this amidst a welter of advertisements, schemes, incompatible statements, and contradictory opinions, which make her every step a veritable hazard.

Neither Ministries nor Governments provide an epitome of proved scientific data for guidance.

The prime object of this book is to fill this need. In addition an attempt has been made to give a bird's-eye view of the subject sufficiently wide to produce intelligent understanding.

Experiments and experiences are quoted for this purpose. Two illustrations will suffice: Grain foods are composed of outer or germinal layers, the layers of life which will reproduce life, and a central portion for the support of life during its earliest stages (*see* p. 24). These germinal layers contain germ oil, proteins, mineral salts and vitamins: essentials for the production of an upstanding vigorous race.

In China, owing to eating white or polished rice (from which these germinal layers have been removed), hundreds of millions of Chinese men, women and children have

grown stunted and suffered illness, deformity, and death, from a deficiency disease called beri-beri (*see* pp. 45-47). This is a proved fact.

In England these germinal layers are omitted from the white loaf and although the Englishman, with a vastly higher income and standard of life than the Chinaman, can afford to spread his diet and in fact does so sufficiently to escape major disaster, it is pertinent to ask "Has there been a corresponding loss of stature, stamina and fertility in this country?" Are the white loaf and other depleted and dead foods responsible for the prevalent bad teeth and that "general deficiency which has labelled us a C 3 nation"? The people should know.

Again, exertion hastens the onset of deficiency disease. This is a fact proved by experiment and experience (*see* pp. 42, 52). Obviously, therefore, adequate supplies of suitable food should precede provision of playing fields, swimming baths, and drill instructors.

The second object of this book is to assist every man and every woman to a bird's-eye view of the subject sufficiently wide to enable them to map out a "long term policy" for the production of a bigger, sturdier, healthier and more vigorous British race. General agreement is necessary for success. The public must be convinced. Scientific data, tested by practical experience, must remove all reasonable doubt.

The producer must be supported by a steady demand. Plentiful supplies of fresh whole foodstuffs, at cheap prices, can only be created by assured and expanding markets. Understanding is essential.

The waste of ignorance, the vagaries of vicious appetite and the crazes of unbalanced temperaments must be eliminated. Mind and body must advance together to attain that democratic ideal: health, the achievement of self-discipline founded on knowledge. The relationship of body to mind, their unity and interdependence, is too often overlooked or forgotten. It is possible, by manipulation of the diet, to increase girth and stature, to strengthen the resisting power of the tissues against the attack of germs, to increase courage, vigour and vitality, or, on the other hand, to diminish all these qualities.

It is possible to maintain health in sunless climates by

eating sun foods (BASICS, p. xi). Fertility and the happiness and contentment of family life can be increased or diminished by the dietary (pp. 39, 42-44). Yet it must be remembered that bodily health is dependent on mental health. A vigorous body cannot be dominated by a feeble mind. Balance must be maintained. Mind and body must develop equally.

The oaf cannot long sustain his vitalities. Dull wits are prone to disease. Hence the schemes of governments and dictators tend to failure, even when inherently beneficial, for mass rule cramps the spirit, and warps its judgments. Without understanding the people perish, because without understanding the mind cannot exercise its functions.

Freedom of choice is the sun diet of the mind as fresh natural foods are the sun diet of the body.

BASICS

Food Basics

THE sun is the source from which life draws all its energies and activities. The earth provides soil, air and water for the sun's use.

Life is vegetable and animal. Vegetable life is primary and animal life is secondary. Vegetable life is primary because vegetables, trees and plants absorb and store the potencies of sun and soil directly into their tissues ; animal life is secondary because animals assimilate the products of the activities of sun and soil indirectly, either by eating vegetables or by eating other animals whose tissues have been built up and nourished on vegetables.

These stored products of the activity of sun, soil, air and water are Nature's foods, variously named, according to their chief sources of origin, as sun foods, sun-life foods and sun diet. Nature's foods can be taken directly by eating fresh vegetable tissues, or indirectly by eating animals which have stored in their bodies sun-life products. Fresh natural foods or sun diet are the first essential of the body and its constant need.

Man is an animal and a mixed eater adapted to live on animal or vegetable tissue, but most suitably on a combination of both. Food may be regarded as Nature's vehicle, agent of transfer, or conveyancing agent, for introducing into the bodies of men and animals the stored products of the energies and activities of the sun, acting on air, soil and water.

Health and vitality can be maintained in sunless countries by living on sun-life foods or sun diet. Virile and sturdy races have flourished on these natural products in the past and can do so again.

The vegetable sun-life foods are whole grain and seeds, green leafy vegetables (including the leaves of plants and trees, etc.), root vegetables and fruits. The animal sun-life foods are the flesh of fish, birds and animals, and eggs and milk.

Sun-life is easily damaged. Time, heat, cold, chemicals, mechanical processes and much handling kill it. Sun diet must therefore be composed of tissues, fresh, crisp, whole and unaltered, i.e. in the natural state. Thus sun diet requires vigorous mastication and is full of stimulating juices and pleasant flavours.

Brilliant colours: golden browns, vivid green and rosy reds. guarantee a high content of food value and are characteristic of sun-life foods. White foods and colourless foods are debilitated foods and support debility. Soft foods produce flabbiness. Eat pap and be pap: Eat grit and have grit: Eat dead foods and die: Eat living foods and live, are truths bluntly stated. Death or life, debility or stamina, feebleness or vitality are the alternatives. Napoleon is reported to have said that an army marches on its stomach. Assuredly a nation strides to success or failure, to life or death, on its food.

Basics of Time and Change

The world is very old and mammalian life and man have inhabited the earth for millions of years.

This enormous period is divided into two parts, a prehistoric or pre-agricultural period and an historic or agricultural period, by the discovery in the Nile Valley, some 8,000 years ago, of methods for the cultivation and storage of wheat.

Wheat cultivation changed man the hunter into man the agriculturalist. Leisure appeared for the first time and resulted in development of the Arts. Henceforward descriptive writing, draftsmanship, building and engineering depict modes of life. Husbandry, cooking and bread-making indicate dietaries.

During the age-long prehistoric or pre-agricultural period man developed from the eater of roots, shoots and grubs into man the hunter, daily pitting his wits and physical strength against those of animals, in the endeavour to add raw steak to his vegetable salads. In this daily struggle the quick-witted and strong survived, the weak and incompetent succumbed. Survival through storm, tempest, earthquake, and ice ages set a premium on quick wits, physical perfection and resistant tissues. Dependence on Nature's provisions, uncooked until the discovery of fire,

and thereafter raw or lightly grilled, adjusted the body to them. During this period man doubled the number of his brain cells, increased his stature and reached an acme of perfection.

Since then he has slowly deteriorated. It is estimated that this degeneration is not only physical, but mental, and that many prehistoric races were endowed with intelligence which to-day would be considered super-average (Dr. Harry Campbell). Food changes upsetting time-wrought adjustments cause disorganization of established physiological processes. This disorganization is known as ill-health or disease. In consequence of age-long physiological adjustments, food changes need care, but a return to Nature is safe.

To-day the agricultural period is passing into an industrial period. Industrialism is primarily an English problem. As wheat cultivation and storage changed life 8,000 years ago in the Nile Valley, so steam altered the conditions, habits and food of the British people. A vastly increased population has resulted. Countrymen have been converted into town dwellers. Imported foodstuffs have replaced home-grown products. New and untested food fashions have arisen. White bread and white flour products, canned foods, and fabricated sugar in enormous quantities, have become staple articles of diet.

In order to visualize the shock to physiological processes thus caused, it is necessary to visualize the relative durations of their periods of stabilization. Measurement by generations is perhaps the clearest method of doing this. If four generations be taken to the century then about four generations cover the industrial revolution, 40 generations arrive at Edward the Confessor, 80 generations at the commencement of the Christian Era, 160 to Middle Egypt and 320 outside the historical period of man. 320 uncontrolled human births are obviously inadequate to modify physiological food requirements stabilized through endless ages. Still more obviously, four generations, during only the last two of which change was rapid, are insufficient for major readjustments: despite that the body has acquired great latitude in its requirements, and extraordinary ability to meet its needs in time of stress.

Food changes therefore demand time, consideration and scientific knowledge. Fashions in National dietetics are dangerous. Nevertheless Nature is generous to her adherents and asks no more than a healthy appetite, a modicum of knowledge and common sense.

Cooking is one of the Arts developed by leisure. The objectives of cooking are gustatory, preservative and sanitary. Intense heat, prolonged heat and chemicals injure and eventually destroy the vital food content. Cooking to destruction and cooking to death are facts. Some fresh uncooked food daily is a cheap insurance against the dietetic dangers of civilization.

SUN DIET

CHAPTER I

NATURAL OR SUN LIFE FOODS

THE foods of Nature are foods in the state in which Nature produced them and to which the body of man has been adapted by long use from primitive times. (BASICS, pp. xii, xiii). Food qualities vary with soil and climate and at different stages of growth. The blade, the shoot, immature and full grain, ripe and unripe fruits have different compositions and potencies.

A grass-fed horse is healthy but muscularly weak. The green blade has not sufficiently stored and matured its tissues to be able when used as the sole food to provide the horse with adequate nourishment for health, growth and work. Moreover, eating is a whole time job.

A hay-fed horse can work. The stalk has sap, and grass seeds have the proteins, minerals salts and vitamins of new life, but still not in sufficiently concentrated form to produce great energies and stamina. Eating is no longer a whole time job and a day's work can be done slowly : nevertheless a hay-fed horse hangs his head.

A corn-fed horse displays superabundant mettle, his courage is apparent on the show ground, and his stamina is demonstrated on race-course and hunting field. Beans plus corn produce rampageous spirits, unless energies are absorbed in grilling work.

Sheep and cattle illustrate how natural foods vary according to soil and treatment.

Cows fed on grass manured with farmyard manure gave milk rich in vitamin content. Artificial manures produced milk poor in vitamins.

In India Sir Robert McCarrison has observed that rice

produced by irrigation develops a lower food value than that fertilized by natural rainfall.

The qualities of wool and mutton depend on the "keep." In other words, they vary with the food produced by soils over which sheep graze.

Knowledge and discrimination are therefore necessary if the best value, and ideal adaptation to needs, are to be obtained. The staple articles of diet must not only be whole, but they must have reached a suitable stage of maturity and they must be fresh, i.e., living in the sense that their vitamin content has not been destroyed.

The signs of life are:—

(1) Reproduction during life.
(2) Decomposition after death.

These two characteristics are the hall-mark of Sun-life foods.

(1) Reproduction

A whole grain dropped into the earth reproduces itself forty, sixty or an hundredfold. Seeds, according to their nature, do the same. The potato, in its skin, is equally fertile. These qualities of life and growth are massed in the germ and germinal layers, and can be transferred to man by eating the whole natural product, whether grain, seed, vegetable or fruit.

(2) Decomposition

All tissues, whether animal or vegetable, commence to disintegrate at the moment of death and decomposition becomes rapid after 24 hours. Milk, eggs, butter, cheese, plants, vegetables, fruits, fish and meat are examples. Although milk and fruit juices may be bottled germ-free, most foods which will keep have been sterilized or treated with chemicals.

In order to acquire their living properties humans must eat foods either in the natural state, or prepared by methods which do not destroy their sun-life content. In these days of quick transport and frequent delivery services, no difficulty should arise from a national return to a diet of natural foods, fresh living and whole.

The question may well be asked: "Why in an age so advanced as the present should any return be advisable?"

The answer is that our National Diet is not the result of scientific decision, undertaken for health purposes, but is the consequence of trade policies, adopted to meet the exigencies of the industrial revolution. The drift from country to town placed a dwindling minority of agricultural workers at the mercy of the majority of town dwellers.

Cheap food, and markets for manufactures, became the urgent need, and the quantity of Exports seemed more important than the quality of the foodstuffs which these Exports bought. A convinced public opinion could have directed these dumped foodstuffs into better channels. Quality might have been as easily attained as quantity, but the change came slowly and knowledge was not available. To-day the position has been displayed. Advantages and disadvantages have been balanced and certain obvious debits calculated.

The outbreak of War in 1914 discovered stunted growth, almost universal dental decay, pigeon chests and groggy limbs. The old standards of recruitment fell with a crash. Public opinion, astonished at the necessity, and staggered by the shock, exaggerated the deficiencies and the nation advertised itself to the world as C 3. A hurried stocktaking took place and has since been going on. Dependence on foreign food supplies displayed town dwellers counting the cost. John Bull, no longer the sturdy and rubicund figure of tradition, had become thin and haggard. The British Lion, once upstanding, virile and regardant, now shrunken, toothless and ineffectual, inviting challenge. Science and experience displayed the cause.

Stunted growth, shabby coats, want of energy and stamina, irritable nerves, inability of parents to live happily together and to manage their offspring, sterility, and a high infant and maternal mortality, proved in rats to be symptoms of deficiencies, not in the quantity but in the qualities of the food intake (*see* pp. 42-44).

At Agricultural Shows throughout the country the results of scientific feeding on animals such as horses, dogs, sheep and pigs, and the similar effects of chemical foods and fertilizers on vegetables and plants, were demonstrated. In town and countryside displays and advertisements drove home the fact that growth, vigour and vitality depend on, and vary with, nutrition; and gardeners and

breeders of animals tested and proved the truth of these statements.

Experience proved that humans responded, in the same way, to the qualities of their food intake. Army recruits increased in weight, and added to their girth and stature according to the values in their diet.

One-third of a pint of milk given to school children improved their general health, accelerated their growth and enhanced their intellectual efficiency.

Soldiers recounted how during the Great War night blindness, paralysis, blood diseases and exhausting debilities disappeared when failure of army rations necessitated subsistence on native foods, despite the fact that these were sparse and rough. Coarse foodstuffs, regarded at first with repulsion, were found to be toothsome and supporters of vigorous health. A hundred years ago the English people fed on them. Not till fifty years ago did Scotland and Ireland allow fabricated foods to invade their strongholds.

Quality not quantity is the issue.

Despite poverty and hardship, starvation is rare. Nevertheless the deficiencies of malnutrition, due to ill feeding, are widespread. Not need but ignorance and want of interest are too often the cause. Teeth and bodily conformation are little better in the House of Lords than in distressed areas, though wealth can disguise its disabilities. Moreover, in distressed areas fertility is higher, and both infant and maternal mortalities are lower than in many salubrious South Coast health resorts.

If the characteristics shown by rats, when fed on a typical English diet, have become national traits (pp. 43, 44), it is in the face of rising standards of life, of scientific discoveries, of hospitals, medical services and State education.

To-day youth shows a marked desire to return to country pursuits. Why not combine this crusade with a return to natural sun-life foods ? They are cheap and abundant or can be made so.

Founded on science and supported by a convinced public opinion, food reform would result in useful economies. Less weekly expenditure and less labour in preparing meals. There is no risk (pp. xii, 86). Nature's foods are toothsome and appetizing. Even when rough in quality

and sparse in quantity they supported vigorous populations in these islands.

Experience has demonstrated that diseases result from interference with nature, in food as in other ways (*see* pp. 41-44). Heat, cold, chemicals, desiccation, prolonged cooking and manufacturing processes, endanger the Vitamin Content of foodstuffs (pp. 43, 52, 65).

It is pertinent to ask, if work would be lessened, costs reduced, and appetites stimulated by natural tastes, what harm could result from a return to the food which produced the Highland Scotsman of the 'sixties, the robust Irish peasant of the 'eighties or the sturdy agricultural workers of Yorkshire, Kent, Sussex and the West Country (*see* BASICS, xi, xii). These natural farmhouse foods form Sun Diet (*see* pp. xii, 16).

Such a change would conform to modern progress, facilities and ideals. Fresh milk is already on the market, and a steady and increasing demand should reduce the price. A revived consumption of freshly-ground whole-grain flour, and of whole-grain bread, would not only improve National health, but would stimulate the home milling industry and benefit home transport services.

Vegetables fresh and washed for cooking, or sorted, cleansed and packed with seasoning herbs, ready to be thrown into the pot for soup-making, should present no difficulty. Like the " Paguet des légumes " sold everywhere in France, such provision would be a blessing to the housewife, and reduce household drudgery, while employing labour outside the home. Soups, freshly made, might be delivered with the milk, and like it in bottles or cartons.

A convinced public opinion sufficiently strong to stabilize demand for certain basic items, such as whole wheaten bread, fresh milk, butter and cheese, eggs, fresh vegetables and fruits, would ultimately reduce costs by enabling producers to estimate requirements, while knowledge of food values would enable housewives to seize opportunities to vary the diet. Seasonal windfalls such as plethora of soft fruits and abnormal catches of herrings or sprats would no longer be wasted.

Expansion of home production, increased employment in healthy, open air pursuits, would coincide with a reduced dependence on foreign supplies.

Even extra cost would not be grudged when public opinion recognized that living food was of greater value to health, and contained properties that no amount of dead foodstuff can provide.

A national return to Nature's foods would not only benefit home industries and improve the health, stature and vitalities of the populace, but would conform to the facts of Science and History.

CHAPTER II

THE GENERAL FUNCTIONS OF FOOD

THE body is a complicated piece of machinery. Complete understanding of the mechanism by which it grows and lives, and carries on its multifarious activities, is not possible without long study. Nevertheless a good idea of these hidden processes can be obtained by analogy with inanimate objects observed daily and with the intricacies of which we are consequently familiar. Thus, growth may be compared to a house in building: the mechanism of heat production to a furnace and power output: movement and muscular activities to a petrol engine or motor car.

Water and oxygen are so universally provided that their presence is taken for granted. With their assistance, food supplies the body with building materials for construction, with workers to work them, and with fuel to be converted into heat, energies and activities.

If the body be compared to a house in building food must be visualized as the source of:—

(*a*) *Building Materials.*

(1) All the different materials used to raise it from foundations to roof.

(2) All the materials needed to instal every conceivable fitment.

(3) All materials needed to supply replacements due to wear and tear, and which in the case of the body cannot be left to periodic overhauls but must be in constant operation without intermission. These are proteins and mineral salts—*see* Tables p. 16.

(*b*) *Workers.*

(4) All the working staff, architects, builders, bricklayers, tilers, carpenters, masons, electricians, plumbers, general labourers, etc., necessary to carry out these multifarious

duties. These are the Vitamins, Chapters VI, VII, VIII, pp. 33-55.

(c) Protectors or Guardians.

(5) Active agents with powers enabling them to fortify the structure and guard it against attack, as watchmen bolt, bar and lock a house, and policemen protect it from damage. These are fresh protective foods, full of vitamins, p. 16.

The quality of the building and whether or no the repairs and replacements improve or diminish that quality, depends not only on the quality of the materials provided for the initial operation, but on that of those provided for upkeep and for subsequent alterations and repairs. Bad materials, weak foundations, thin walls, cheap fitments, faulty plumbing and wiring, are incapable of subsequent alteration to make a really good house. On the other hand an initially well-built structure, although spoilt by subsequent bad materials and workmanship, maintains throughout its life something of its original strength and beauty.

The body is a living organism made up of tissue cells constantly in need of repair. Injury, illness and overwork destroy body tissue, and breakdown gangs with materials (protein and mineral salts) and workers (vitamins) must be rushed to the spot:—

(1) To do immediate repairs sufficient to enable the structure to continue to perform its functions.

(2) To carry away broken down tissue.

(3) To effect replacements as far as possible.

How completely the rubble and scrap heaps caused by the damage done are cleared and how efficiently the new parts are constructed depends on the quality of material supplied and on the competence and energy of the workers, i.e. on whether or no the food intake meets all requirements for a first-class job.

No actual extensions to the original building are possible. An arm, a leg, a kidney once lost cannot be replaced. The original building plan being, however, a duplication of two sides round a central column, loss of an organ on one side may be compensated by hypertrophy, or increase in size, on the other. If and only if, adequate materials

and workers are supplied in food, this takes place. For instance, on removal of one kidney there can be no replacement, but the opposite kidney hypertrophies in order to cope with the extra work. This enlargement frequently proceeds until the remaining kidney is double its original size and weight. Obviously there is double the amount of work to be done, and in this case perfect compensation has been achieved.

The body may be compared to an engine and on this analogy food is the fuel burned to provide heat for a temperature in blood and tissue of 98·4° F., and for the energies expended in movement and work.

There are two classes of fuel foods—FATS and CARBO-HYDRATES:—

Fat is the most suitable agent for the maintenance of body heat as it burns slowly like coke or an oak log.

Carbo-hydrates, though heat producers, are used at maximum efficiency as energy producers. They burn quickly like a bright coal, and some are so inflammable that they may be said to burst into flames like shavings or paper.

Each of the fuel foods can to some extent supply the needs of the other, but obviously the slow burning fats are suitable for the production of a steady and regular temperature, while the quick blaze of carbo-hydrates is ideal for meeting sudden calls to action.

Carbo-hydrates are subdivided into starches and sugars. Starch is converted into sugar in the bowel by the process of digestion, before absorption into the blood and tissues. Sugar may be regarded as the emergency ration for sudden use and starch as the store on which to draw for prolonged exertion.

These five foodstuffs—proteins, fats, starches, sugar and mineral salts—build, restore and sustain the body throughout life and maintain all its activities. As would be expected they are required in different proportions to suit the different needs of infancy, childhood, youth, prime and age. Obviously also the amount and composition of the materials supplied has a great influence on growth, stature and bodily conformation, and must be varied according to the bodies' activities, i.e. according to the needs of output—physical work needing more than sedentary occupations.

Climate has also considerable influence. People in cold climates, owing to loss of body heat, need more fat. Esquimaux drink oil and eat blubber. Those in hot climates need little fat to balance heat loss and in them bodily activities are most efficiently sustained by carbohydates. The basic food of the tropics is rice.

During Infancy, while, so to speak, the house is in building, and only light body movements are possible, building materials (proteins and mineral salts) are the chief need.

In Youth building operations continue, while at the same time body heat must be maintained under an active output of energy. Boys and girls, therefore, must not only receive adequate building materials, but these must be reinforced with supplies of heat and energy producers sufficient to meet all needs.

After the Age of 21 new building ceases and building materials are required only for replacement and repairs, and to assist the fuel foods in the production of heat and energy.

In Old Age, as the bodily activities wane, less food is required.

Comparison of the Body and its Processes to a Motor Engine

When a Motor Engine is Raced or carries a heavy load the faster revolutions and harder work are evidenced by heat, noise, and increased wear and tear. An increased production of waste products results. Also more petrol is used. In the car the waste products of combustion are deposited on the cylinders as carbon, and crude spirit or too rich a mixture increases the amount of this deposit.

Precisely the same sequence takes place in man. Watch a man running up hill. The puffing and blowing of hurried respiration is noisy. On a frosty morning, production of heat is shown by an aura of condensation around the body, and steam is seen to be issuing from the lungs in the breath. When exertion is prolonged more fuel foods are burned, but an excessive or injudicious intake sooner or later requires a visit to the doctor, when dieting or treatment at a spa (corresponding to decarbonization in the car) will be ordered.

Machinery needs periods of rest or metals undergo

crystallization. Man as a sentient being feels fatigue, and rest gives time for repairs to be put through, for clogged tissues to be cleansed, and for new energy to be stored for the next venture.

While petrol is fed to the engine strictly regulated to its needs through a carburettor, humans supply their own needs less carefully. Luckily the body is capable of such infinite variability, and Nature is such a generous and universal provider, that these apparently complicated food problems in practice become simple.

Food cannot function without three assistants, water, oxygen and sunlight, and Nature surrounds us with these for the following purposes:—

WATER acts as a heat regulator and supplies a water carriage system through the medium of the blood for the porterage of building staffs, with their materials, to the site of operation ; and for the elimination of waste products.

Digestion is the conversion of insoluble into soluble elements which are picked up by the water and carried through the membrane of the bowel into the blood. The blood in circulation courses through every organ and bathes every tissue cell, carrying with it the materials and workers they need, and picking up the refuse of tissue-change, to be discharged on the return journey by means of the organs of elimination, i.e. the skin, kidneys, liver, bowels and breath. For the easy performance of these operations more fluid is required than is habitually taken by the majority of people.

Nine-tenths of the blood and three-fourths of the tissues are composed of water, and a man may be regarded as a perambulating water spout.

Deficient intake of water has the following results:—

(1) *Bowel stasis,* i.e. the contents of the bowel do not progress at the normal rate.

(2) *Delayed digestion* and imperfect absorption of foodstuffs.

(3) *Decomposition of ill-digested material* with formation of injurious by-products.

(4) *A clogged condition of the blood. The blood becomes thick,* grumous and loaded with impurities.

(5) *Deficient elimination.*

The natural outlets are blocked. Headache, fatigue, lassitude, a furred tongue and heavy breath proclaim the impasse.

On the other hand a vigorous flow of water:—

(1) *Moves the bowel contents at a normal rate.*

(2) *Promotes digestion.*

(3) *Picks up the healthy products* of normal digestion and carries them in solution through the membrane of the bowel into the blood.

(4) *Provides a freely flowing water carriage system* to take them to their destinations.

(5) *Provides the ideal solvent to pick up waste products* and return them to the organs of elimination.

(6) *Makes all evacuation easy.*

(7) *Generally washes the whole internal economy.*

Bright eyes, brisk movements, feelings of vigour and cheerfulness, with a clean tongue and sweet breath, are the evidence of well-performed function.

The amount of fluid necessary.—This obviously varies with climate, work and the quantity and quality of food intake. In hot climates the heat regulating centre opens the sweat pores and the skin becomes covered with beads of perspiration and the dissipation of this moisture into the air absorbs heat. Thus the body is cooled by loss of heat due to evaporation in the same way as are the contents of porous earthenware jars when these are hung in a draught in hot countries. Damp cloths wrapped round jugs of, say milk, which are then placed in a situation where a current of air is passing, will produce the same effect on a less efficient scale. Work and heavy meals result in excess of waste products to be carried away for elimination. Water is the porter. Illness and anxiety increase the need for water. Physical and mental shock have the same effect. Babies at the breast or on bottle feeds need water between meals. Water is more necessary inside than outside the body. Were the inside of the body as visible as the outside most people would be shamed into a hurried water cure. Because water is cheap and always at hand the blessings of a daily bath to the internal organs are too often disregarded.

A fair allowance for ordinary purposes would be a

tumblerful on waking and a tumblerful an hour before meals. This amount will keep the tissues clean, sweet and in good heart and may be increased to balance the needs of climate, work and diet.

OXYGEN.—The air is composed of oxygen largely diluted with a neutral gas, nitrogen. The lungs act as a bellows, drawing in air, which is passed into the depths of the lungs and is thence absorbed into the blood for circulation. As the blood picks up fresh supplies of oxygen, the harmful gases of combustion are discharged into the harmless waiting nitrogen, which dilutes them as it did the active oxygen. Then the expanded lung under the weight of atmospheric pressure, the action of the muscles or respiration, and the elasticity of the lungs themselves, expels these gases in a movement of expiration.

Oxygen revivifies cell tissue, and burns up fuel foods, thus sustaining the fire of life, and supplying the body with heat and with energy for all its activities. Heavy work and heavy diets need more oxygen, and food intake should be arranged according to requirements. Respiration may be left to nature, because a respiratory centre in the brain will do the necessary regulation automatically. Only a definite amount of oxygen is required for each process. A dozen rapid and deep respirations taken when sitting in an armchair will be followed by a slower and shallower intake until the balance is restored. Nature abhors waste and will not burn up its tissues unnecessarily.

SUNLIGHT is foods' third assistant. The sun is the source of all life and energy. Sunlight destroys germs and is consequently the great purifier.

Sunlight on the Body:—

(1) Actuates tissue change.

(2) Kills germs.

(3) Produces vitamin D, which stimulates the growth of bones and teeth.

Excess of Sunlight on the Body:—

(1) Breaks down tissue and in the end destroys it.

(2) During prolonged exposure the heat regulating centre works hard to preserve the normal balance, but under adverse circumstances, such as when radiation is difficult, it tires and gives up the effort.

(3) When the heat regulating centre thus fails to hold on, hyperpyrexia or heat stroke results. The temperature mounts from 98·4° (the normal) to 105°, 106°, 107°, 108°, and even 110°. The tissues are boiled and destroyed and death results. A cold immersion with ice on the head and in the bath may save life.

As a protection against the destructive powers of excessive sunlight, in sunny or tropical countries the skin throws up a layer of dark pigment which acts as a screen or filter to prevent an overdose. Races living in these regions become yellow, brown or black according to their need for protection.

Fair-haired, blue-eyed, white-skinned people do not readily undergo this pigmentation. The blue iris exposes the retina to excess of the sun's rays. Light silky hair affords inadequate protection to the brain. Some covering for the head and light clothing on the body is essential. Any tendency to tuberculosis makes excessive exposure to the sun's rays dangerous, despite the fact that sunlight can kill the tubercle bacillus. The increased tissue activity resulting may light up quiescent foci of disease. Exposures should be only for a few minutes and progressive, and measured by the amount of pigmentation produced. Skilled medical supervision is essential and reckless unskilled attempts have resulted in a gallop to death.

The Sun and Life.—The sun is the source of life, first of vegetable life, then of animal life. (*See* BASICS, pp. xi, xii.) Food is the product of the sun's action and the soil's qualities, and the conveyancer, or agent, by which these are transported to the body for assimilation into its tissues (BASICS, p. xi) and the life of every cell in the body depends on and varies with potencies in the food intake. Death of the sun-life content of food renders it incapable of supporting life and devitalized diets produce debilities and disease.

In order that sun life may constantly permeate and revivify these tissues, all animals, and notably fish and sea birds, store reserves in their deep organs, the liver, kidneys, heart, brain, glands and the blood. Consequently the livers of animals, fish and of sea birds are natural storehouses of sun-life.

The living elements constituting sun-life are called

vitamins, and their manufacture is continuous on sea, land, lake, and river. The superb health, great courage and enormous vitality of the great Carnivora prove the efficacy of acquiring sun-life at second-hand, and instincts which taught these animals to seize, and fight for, the blood and deep organs, are explained by the discovery that these deep organs form sun-life storehouses. (*See* BASICS, pp. xi, xii.)

Man, as a mixed eater and a sun lover, and capable of himself manufacturing vitamin D in his own tissues, should be in an outstanding position to support his vitalities. He can pick and choose and give reasons. He can eat vegetables, plants and fruits in which the sun's rays have stored both food and vitamins. He can eat the flesh of fish and beast and select the parts best suited to his purposes. History demonstrates that he has done so. Oats, wheat, maize and rice were adopted as cereal foods to suit the respective climates in which they grow. Animals gave milk, the perfect food for young and old. They were domesticated and bred to fulfil this basic need of the years both of growth and of decay. Flesh raw or slightly cooked is a stimulating and living protein food, usually offered with a suitable proportion of fat.

Where sunshine was scarce, herrings, and the liver and roes of fish, as also of animals in a lesser degree, supplied, in concentrated form, stores of vitamin denied by climate and, long before science discovered the fact, men had used fish oils, such as cod-liver oil, to fulfil their need of vitamin D. In the Arctic and as far south as the Hebrides, sturdy races preserved themselves in good health, and with low infant and maternal mortalities, without science or hygiene to assist them, by living on Nature's foods. Deficiencies due to want of sunshine were supplied by eating sunshine manufactured foods, full of vitamins, produced in the minute vegetable life of sunlit river, lake, sea and ocean and stored in the cod's liver in the form of cod-liver oil. Sparse diets of natural foods have supported great races, and would do so again.

CLASSIFICATION OF FOODS IS INSTRUCTIVE BUT NOT ESSENTIAL

Nature is a generous provider. Those who enjoy an appetite for plain food, and means to a sufficiency, need

have no anxiety. All their necessities will be fulfilled. Nevertheless, on the understanding that overlapping is universal and that each variety of foodstuff contains others, the following table is appended:—

Building Foods: Protein and Mineral Salts

Protein.—The flesh and internal organs of animals, fish and birds. Eggs, milk, skimmed milk, cheese. Nuts. The outer or germinal layers of grain and seeds (peas and beans have a high content and are cheap). Vegetables and fruits in small but varying quantities.

Mineral Salts.—Milk, cheese, green vegetables, fruits, eggs, liver, fish and meat (especially the bones).

Protective Foods

Milk and its derivatives butter, cream, cheese. Fresh vegetables and fruits, especially those characterized by high colour, such as vivid greens and rosy reds. Liver, notably fish-livers and fish-liver oils. Fat fish and their roes. Eggs.

Fuel Foods

Heat Producers.—Fats, both animal and vegetable. Animal fats such as the fat of beef, mutton, pork, etc., and fat fish such as herrings are the most efficient. Milk, butter, fat cheeses. Eggs. Vegetable oils such as olive oil. Oils extracted from beans and seeds. Nut butter or margarine.

Energy Producers.—Starches and sugars.

Starches: Root vegetables such as the potato, carrot, parsnip, etc. The central portion of grain and seeds, wheat, barley, oats and rye, peas, beans, nuts.

Sugars: Honey, fruits, sugar canes. Fabricated sugars.

CHAPTER III

DIGESTION

TWENTY-SIX feet of bowel, in one long tube, convey food from inlet to outlet. Throughout this length progress is continuous but the pace varies as do the functions of the numerous sections, long and short, wide and narrow into which it is divided. The whole tube is lined by mucous membrane, except at the two ends, entrance and outlet. This mucous membrane pours out digestive juices and at the same time absorbs the products of digestion.

Round the bowel are muscular layers, circular and longitudinal, which by a constant movement of contraction and relaxation break up the food particles into a pultaceous mass. The juices emulsify this mass and convert insoluble into soluble products, which can then pass through the cell-lining, into the blood. Certain foods are capable of effecting this passage with little change, others require more time and an elaborate process. In several places, valves are fitted which act like a dam, retaining the food until a certain stage of digestion has been reached. Here and there also are openings down which additional digestive juices flow in considerable quantities. This digestive tube, open at both ends, and armed to prevent absorption into the blood and tissues of undigested and harmful materials, may in a sense be regarded as passing through the body rather than as being part of it.

It is obvious that the food passage must be complete every twenty-four hours, or blockage will result.

Four main functions are performed by the varying parts of the digestive tube, and although one procedure predominates in one section and another in another, elsewhere and

generally they are conducted together. These functions are:—

(1) The breaking up of food into minute particles.
(2) The secretion of digestive juices.
(3) The continuous passing on of bowel contents.
(4) The digestion or conversion of insoluble into soluble products, and absorption of these soluble and digested materials through the fine membranous lining into the blood.

Each outlet is under the control of volition. Its duties are undertaken voluntarily. The movements and control of nine-tenths of the bowel are involuntary, and produce in health no sensation. Knowledge that something is going on, as evidenced by discomfort or pain, is a sign of disorder. Although the bowel performs its functions involuntarily, i.e. without our knowledge or control, the whole process is regulated by the brain, and brain upsets, emotional crises, fear, anger and anxiety, by distracting the brain cause digestive disturbances.

The lips seize food and maintain its position while the incisor teeth bite off the required amount, and until the tongue and other muscles can pass it between the molar teeth for mastication.

The lips are also sensitive registers of temperature and neither food nor liquid should be taken until held against the lips without pain. The tongue and lining of the mouth also are sensitive to heat. In stomach and bowel this power is largely lost. Drinking soup and tea so hot that it cannot be retained against the lips or in the mouth but must be swallowed before the tissues are scalded, merely transfers the scalding from a sensitive part where it can be felt to an insensitive part, where the damage is done more or less painlessly. Ulcers and growths may result. Drinking scalding fluids is one of the bad habits which seem to overtake civilized communities. For not only are tissues damaged, but the enamel of the teeth is cracked, and a point for the entrance of germs made from which subsequent decay must result. Primitive races, savages and animals are more sensible than we are in this respect.

Molar teeth surround the mouth for adequate mastication, and this should be performed effectively by all who desire full value from food eaten and comfortable digestion.

Saliva.—Some twenty pints of saliva are secreted into the mouth each twenty-four hours. It is an alkaline mouth wash, serving to wash the teeth, keep the tongue moist, dilute the food, and partially digest starch. For this purpose the saliva contains a ferment called ptyalin. Mouth breathing evaporates this saliva and deprives the body of its digestive functions. Some drugs and notably tobacco restrict the amount secreted. When food has been masticated and thoroughly mixed with saliva it is swallowed and passed into the stomach by muscular contractions of the gullet. Once swallowed the food passes beyond voluntary control, until its arrival near the outlet where retention is allowed for some hours in the large bowel, while remaining foodstuffs and water are absorbed and until a convenient moment for evacuation presents itself.

For health, regular evacuation morning and night is essential; otherwise delay causes decomposition, with absorption of poisons into the system. Headaches, lassitude, clogged tissues and a muddy complexion are symptoms of the toxæmia thus produced.

Constipation can be cured by:—

(1) Formation of a fixed habit with a generous allowance of time for completion of the function.
(2) Regular exercise and exercises to strengthen the abdominal muscles.
(3) Three or four pints of water daily for flushing purposes.
(4) A generous supply of vitamin B. (Any whole grain such as oats or wheat will provide this if the vitamin is not destroyed.)
(5) Sufficient roughage—grain, green vegetables such as cabbage, spinach, lettuce, cauliflower, turnip-tops and roots will supply this. (Roughage retains water and gives the bowel a bulk on which to act while sweeping the passage clean.)

Roughage is the term applied to the cell wall material of plant foods. It is not available as nourishment. Probably about 50 per cent. is evacuated undigested and the other 50 per cent. disappears as the result of bacterial action. (*See* "Food," McCarrison, and "Food and Dietetics," Hutchison & Mottram.) From the stomach to near the outlet.

digestion is automatic and involuntary. The task has been set and must be accomplished, as best it may, with the means at disposal. The main function of the stomach is conversion of protein into soluble peptone, and a valve at its outlet (the pylorus) retains food until this has been accomplished, when it is allowed to proceed.

The Small Bowel:—

(1) Continues this proteid digestion and
(2) converts insoluble starch into sugar,
(3) absorbs and saponifies fats, and is,
(4) on account of its length, the main area for absorption of digested materials into the blood.

The number of meals and the hours at which they should be taken depend on age, constitution, habit and convenience. An interval for digestion depending on the volume and quality are essential. Generally children, invalids and women need to eat more frequently than men. Robust men have maintained perfect health on one meal in the twenty-four hours, usually taken in this country about 7.30 p.m. and on the Continent at noon. The saving of labour is considerable. Three or four meals meet the average family requirements.

Hunger is the best sauce. The sight and smell of food should excite pleasurable anticipation, as these stimulate and promote a copious secretion of digestive juices into the various parts of the bowel, and ensure complete digestion. The French chef organizes a short delay, after his clients are seated, in order that the excitement of anticipation may increase this flow.

To the harassed housewife with a family, ever recurrent cooking is a bugbear. As the working day grows shorter, meal times should be reorganized to give her relief. Cooked breakfast and dinner or supper are ample, if snacks of uncooked natural foodstuffs are organized between times. Fresh milk, sour milk, skimmed milk junkets, whole-wheat bread or biscuits, cheeses, eggs, salads, vegetable sandwiches, fruits with a slice of home-made cake, are tasty and health-giving. Fruit should be the last thing taken in order to cleanse the teeth with their preservative juices. Incidentally and for the same reason last thing at night (*see* p. 27).

Vegetable sandwiches are made of chopped carrot, cabbage, lettuce, cresses, tomatoes, etc., seasoned with celery, onions, leaks, parsley, packed between slices of well-buttered whole-wheaten bread. The minimum of preparation and washing-up is thus secured, with a full and vital diet.

The staying power of Nature's foods must be experienced to be appreciated. Hunger is the call of the blood for living food, and a stomach full of dead food produces a feeling of inadequacy commonly called "sinking." The harried housewife flies to a cup of strong tea, the unsatisfied husband goes out for a pint, and the children are taken to the doctor or chemist for the mineral salts and vitamins of which they have been deprived. Happy family life depends on the satisfaction and well fed nerves which Nature's foods can alone provide (*see* pp. 43, 44).

CHAPTER IV

THE CONSTITUTION AND CHEMISTRY OF FOODS

FOODSTUFFS may be divided into five classes:—

(1) Proteins.
(2) Fats or hydrocarbons.
(3) Starch } carbohydrates.
(4) Sugar }
(5) Mineral Salts.

Activated by five living principles or essences—Vitamins A, B, C, D, E.

Mainly composed of five chemical elements—(1) Nitrogen, (2) Carbon, (3) Hydrogen, (4) Oxygen, (5) A Mineral group.

Proteins or Proteids

These are the nitrogenous foods, so called because they contain a high proportion of the chemical element nitrogen. Meat is the best known representative. Its tissues being similar in composition to human tissues are digested in the stomach and quickly reach the blood-stream for use as body builders and stimulants to bodily activity. Any portion undigested in the stomach is dealt with by the lower bowel. These nitrogenous foods are subdivided according to their source of origin into:—

(1) Vegetable proteins.
(2) Animal proteins.

Vegetable proteins are found in: (1) The germ and outer layers of wheat, oats, barley, rice, maize and nuts; (2) Peas, beans and seeds, especially activated by vitamin content when these seeds commence to sprout, and are known as pulses; (3) Green and root vegetables and fruits in small quantities.

Animal proteins are found in: (1) Milk; (2) Eggs; (3) Flesh of all fishes, birds and animals.

The chief function of protein foods is to build the frame and tissues of the body and to stimulate their activities. Proteins are acid forming and need to be neutralized with four times their weight of green vegetables.

Excess of protein produces acidity in the intestinal tract and these acids, when absorbed into the blood, pass into the tissues and cause headache, malaise and nervous irritability. The blood-pressure is raised and the arteries hardened. Habitual over-eaters of animal protein foods tend to be rheumatic or gouty and may ultimately develop strokes, convulsions and stone in the bladder or kidneys.

Deficient protein results in stunted growth, poor physique, slack muscles and inability for prolonged exertion, physical or mental. Resistance to diseases such as tuberculosis is reduced. Many active and healthy people live largely on animal protein. The advantages are its rapid digestion and small bulk. Meals are concentrated, quickly taken and easily carried.

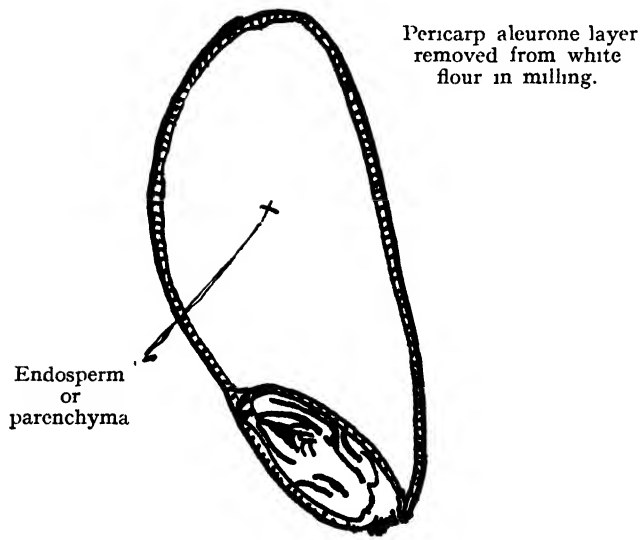
In this country a moderate mixed diet is the ideal. Nevertheless, those who dislike meat or eschew it for particular reasons can rely on the vegetable kingdom for proteins. The following are said to have proclaimed themselves vegetarians: Socrates, Plato, Pythagoras, Plutarch, Seneca, Ovid, Tertullian, Chrysostom, Wesley, General Booth, Howard (prison reformer), Newton, Leonardo da Vinci, Sir Joseph Banks, Richardson (novelist), Shelley, Tolstoy, Ed. Carpenter, Gilbert Murray and Bernard Shaw. Neither bodily activity nor brain power appear to have suffered.

Milk contains protein, and also every class of foodstuff, being a complete food and the sole support of infancy. Hand skim-milk has been deprived of nine-tenths of its fat contents. But protein, one-tenth fat, carbo-hydrate in the form of easily assimilable milk-sugar, and all the mineral salts and some of the vitamins, remain. It is a valuable food, now too often given to pigs, but in former days sturdy agricultural populations were brought up on it (*See* "Waste," p. 81.)

As an addition to soups, or allowed to go sour and eaten with sugar, or used soured to make soda bread, cakes and scones, skim-milk, price-for-price, is more valuable than whole-milk, and growing children who cannot digest fat

find the mineral salts and protein excellent for bone formation. The famous Dorset "blue vinny" cheese is made from it. When added to soup the temperature should not be raised above 150° F., or curdling takes place. Consequently, it should be added last thing before serving. 120° F. is the highest temperature a finger can support and the handle of a metal spoon makes a rough test as the soup is stirred.

DIAGRAM OF WHEAT GRAIN.



Bread is a staple food. Made from fresh whole ground wheat, it was long known as "the staff of life." The wheat grain and all grains and seeds are composed of three parts:—

(1) *The Germ* which is to reproduce life.
(2) *The Outer Layer* or rind which feeds the germ in its earliest days as it bursts into life.
(3) *The Centre* which supports the young plant until roots and leaves enable it to carry on a separate existence and secure food from the soil and from the air with the aid of the sun's rays.

The *germ* and *rind* are composed of protein, mineral salts and rich vitamins, i.e. they are full of body-building materials and active workers. (*See* pp. 8, 16, 46-47.)

In milling white flour this germ and the outer germinal layers are discarded as offal. Their notable qualities are thereby lost. Building materials thus wasted must be bought back in other, costlier and less potent forms.

The body or central portion of the grain is composed of starch on which the young plant supports itself, at need, should soil, sun and air prove unpropitious. This centre contains a bare trace of protein and no vitamin. White flour is made from it and white flour products used in bread, cakes, puddings and biscuits have become the staple cereal foodstuff chosen by the majority of the British people for their support.

Fats

These are composed of the chemical elements, carbon, hydrogen and oxygen with a smaller proportion of the oxygen content.

There are two classes of fats:—

(1) *Animal fats* found (*a*) in milk, cream, butter, cheese—especially cream cheeses; (*b*) in the fat of animals, the marrow of bones, in lard, suet and drippings; (*c*) in fat fish such as salmon and herrings and in fish liver and roes; (*d*) Fish oils, such as cod-liver oil.

(2) *Vegetable fats* found in nuts and seeds: olive, linseed and cotton oils and margarine are examples. Asparagus, turnip-tops, brussels sprouts, parsnips, artichokes, cauliflower, lettuce and spinach contain a little fat.

Animal fats are fuel foods, slow burning and giving out intense heat. They have a high vitamin content and are the great bone formers and increasers of tissue resistance. The vitamin content of fish oils is very high and cod liver oil was used for generations empirically for the above purposes, before these facts were known.

Vegetable fats have a lower capacity for heat production and a lower vitamin content than animal fats. Fats can be absorbed directly into the body: otherwise they are saponified and rendered soluble by digestion in the bowel, and so passed into the blood. When not burnt as fuel foods they are stored under the skin and around the deep

organs. Under the skin fat acts as a buffer against injury, an insulating layer against cold and loss of body heat, and as a reserve against need. Round the deep organs, fat deposits act as a sort of elastic cement, protecting them, keeping them warm and holding them in position. Thin people, owing to absorption of these supporting beds of fat, often have loose internal organs. Loose kidney is due to this cause. Absence of fat reduces bodily vigour and lessens tissue resistance to attack by the germs of disease. Infants during the formation of bones and teeth need relatively much more fat than their parents. It has been estimated that an 8-months baby and its father need the same actual weight of fat. The children of slimming mothers cannot form strong bones and hard teeth, and at birth start life with a serious handicap. The craze for slimming amongst women is physiologically indefensible. Any young man who wants a mother for his children should bear this in mind. As the camel lives on his hump, humans can, to some extent, live on their own fat in times of stress.

Carbo-hydrates

These are composed of the same chemical elements as fats, viz. carbon, hydrogen and oxygen, but arranged with a greater proportionate amount of oxygen. There are two classes of carbo-hydrates:—

(1) Starches.
(2) Sugars.

Starches are found: (*a*) in the inner white part of the grain—wheat, oats, barley, sago, etc., but especially in rice and maize; (*b*) in the central core of seeds, such as peas and beans, etc.; and (*c*) *par excellence,* in the tubers or root vegetables, potatoes, beetroot, carrots, parsnips, etc.

Sugars are found in milk as milk sugar, and in honey, fruits and sugar canes.

These carbo-hydrates are brisk-burning fuel foods, chiefly concerned in the production of energy. They are widely distributed and cheap, and flare up in combustion like paper or shavings. To-day sugar is largely made in factories from beet and other starchy substances. This artificial sugar is by no means the same as honey, fruit, and cane sugars, which are living foods produced by the

sun and in their native state found mixed with acid juices, mineral salts and vitamins. Consumption of sugar is to-day enormous in this country. On average it amounts to 95 lb. per head of the population, costing £50,000,000 per annum. Sixty years ago a sweet shop was a rarity. Sweets were home-made of cane and fruit sugars and were sold as a side line in fancy goods shops frequented by ladies, who took home a small bag of barley sugar or bull's-eyes as a treat for the children. To-day towns and cities are peppered with sweet shops and roads are freely sprinkled with perambulating sweetstuff and ice-cream vendors. Sugar is only found in Nature in milk, honey, fruits and canes. The supply is distinctly moderate. The larger length of the human bowel is organized for the conversion of starch into sugar. Many pints of digestive fluid are poured out daily to effect this purpose. *Fashion and a national change in dietetic habit now condemn these digestive secretions to remain idle.* Moreover, sugar is predominantly factory made by artificial means and without the living proteins, mineral salts and acids of Nature: these fortify the tissues, cleanse the bowel and preserve the teeth and are mixed with substances requiring mastication. The end-results of such a tremendous and unnatural change cannot be foreseen, but ill-developed jaws, irregular decaying teeth, and disorganization of bowel function must be harmful.

CHAPTER V

MINERAL SALTS

THERE are some twenty chemical elements in this group, though many of them are found in Nature only in minute quantities.

THE MINERAL SALTS ARE DIVIDED INTO TWO GROUPS

ALKALINE or ALKALI-FORMERS:—Calcium, potassium, sodium, magnesium, lithium, barium, manganese, iron, zinc and copper.

ACID-FORMERS:—Phosphorus, sulphur, silicon, iodine, chlorine and fluorine.

A correct balance between these two classes is essential to health, in order that the blood and tissues should maintain the right reaction. This difficulty is not so great as it seems, for Nature links them together in more or less neutral combinations. Phosphorus may be cited as an example. This acid-former occurs largely in vegetables such as the cabbage, linked with calcium, and this calcium phosphate occurs associated with other phosphate salts, such as phosphate of potassium, sodium and magnesium. Milk, the most valuable source of mineral salts in infancy and childhood, contains both acid-formers and alkali-formers so accurately adjusted that it may be regarded as neutral. If cereals, vegetables and fruits be added to milk it may be generally assumed that Nature will balance her needs if not interfered with.

Calcium is found in milk, cheese, turnip-tops and other green-leaf vegetables, broccoli, spinach, outer leaves of cabbage, egg-yolk, peas, beans, nuts, grain, fruits, especially those with edible seeds, the skins of oranges and lemons, dried figs and watercress. Deficiency of calcium salts results in soft bones and teeth, and weak functioning of all the main organs. The body muscles and those of the bowel are slack. The heart beats weakly, the nerves lose control, the clotting powers of the blood and the capillary

circulation are weakened. Women need more calcium salts than men. The expectant mother has special requirements, not only to meet the increased demand of her own metabolism, but also those of the growing fœtus. Infants and growing children need fats and calcium salts in amounts out of all proportion to their size and weight. Roughly speaking, they and their parents should partake equally. One pint of milk daily may be taken as the measure of a child's calcium needs. Calcium deficiency results in decalcification of bones, impaired muscular activity, nervous excitability, tetany, disturbance of cardiac rhythm, chilblains, and irritability of the skin.

Phosphorus is the most universally distributed chemical element in the body, as it is one of the most important. It is necessary to the health and growth of tissue and hardly a cell in the body is without it. Bones and teeth are built of calcium phosphate, and brain, nerve tissue, the blood, and the sexual organs contain a high proportion of phosphorus in various combinations; for it not only builds and supports their structures, but stimulates the cells to which growth is due, and regulates their proper functioning.

Phosphorus is the mainstay:—

(1) of the bony skeleton round which the body is built;
(2) of the teeth, which manipulate food and keep the mouth clean or otherwise;
(3) of the muscles and tissues, which clothe the bony skeleton and move it about its daily duties;
(4) of the blood which feeds all these tissues;
(5) of the brain and nervous system which activate and control all tissues;
(6) of the sexual organs on which the propagation of the race depends.

Phosphorus deficiency leads to stunted growth, soft bones and teeth, disturbance of the neutrality of the blood and a general depression of the vital processes of the body.

The chief sources of phosphorus are:—

(1) Milk and its products, cheese;
(2) Eggs (yolk) and animal fats;
(3) The germ and outer layers of grain and seeds;

(4) Fish, bones and bone-marrow:
(5) Lean meat, liver;
(6) Green vegetables of all kinds: carrageen-moss, cabbage, spinach and watercress, mushrooms, horse-radish:
(7) Root vegetables, especially radishes, carrots, cucumbers—also potatoes;
(8) Nuts: Barcelona nuts, almonds, peanuts, Brazil nuts;
(9) Dried pulses.

White flour contains little or no phosphorus. In the potato it resides around the eye and near the skin, as it does in concentrated form in the germ and rind or outer layers of grain and seeds, and in the skin of fish. Bones and marrow of bone are full of it. Unfortunately, these are sources largely rejected by the habits and tastes of the present day.

Iron is a most important mineral constituent of the hæmoglobin of the blood, to which it imparts its red colour. Oxygen, lightly linked in an easily dissociated combination with hæmoglobin, is thus carried to every tissue in the remotest part of the body. Without a good supply of iron, this porterage function of the blood is inadequately accomplished and deficient oxygenation of the tissues results. Pallor, lassitude, breathlessness, and a general anæmic condition of the tissues are evidences of insufficiency of iron. Children and women need more iron than men.

The chief sources of iron are:—

(1) Red meats, liver, eggs;
(2) Whole cereal grain and seeds, lentils;
(3) Green vegetables, such as spinach, lettuce, turnip-tops, leeks and onions;
(4) Fruits, strawberries, tomatoes, prunes, dates and raisins, cranberries, blackberries, red currants, loganberries, mulberries, raspberries;
(5) Dried peaches and apricots have been reported as containing iron;
(6) Black treacle.

"The diet should contain 15 mg. of iron daily. During pregnancy this should be increased to 20 mg.

Milk is poor in iron and a healthy child is born with stored supplies drawn from its mother's blood sufficient to compensate for this deficiency. The daily loss of iron through the bowels and the kidneys is about 1/300 part of the total hæmoglobin iron in the body" (McCarrison).

Copper is found in mushrooms and dried butter beans.

Common salt or sodium chloride:—

The sea is a vast storehouse of chlorides and has left deposits on land, widely distributed. Chlorides are also found in salt rocks and in salt springs. Meat contains sodium chloride, and fruits and vegetables contain small quantities, especially cabbage, lettuce, celery, tomatoes, spinach, bananas and pineapple. As common salt is always on the table, it is easier to eat too much than too little, especially so as it is universally used in cooking. Meat eaters require little salt, while vegetable eaters require a moderate amount.

Functions: Common salt retains water in the tissues and adjusts the thickness of the blood.

Excess of common salt, by retaining water in the tissues, tends to prevent quick and effective elimination of waste products, and to clog the blood and tissues with impurities. Excretion from tissues thus waterlogged with brackish concentrates irritates the kidneys and other eliminative organs. The gastric juice contains hydrochloric acid for the assistance of the processes of stomach digestion. Excess of salt in the diet is a cause of hyperchlorhydria, or excessive acidity of the gastric juice. In consequence food is too quickly digested and hunger is ever present. This excess of acid may also corrode the stomach walls and cause ulceration.

Iodine: The sea contains iodine, consequently sea fish and their oils are important sources of supply. Herrings contain more than mussels, salmon, cod, or oysters. Seaweed has been eaten for this purpose. Iodine is widely distributed in the soil whence it is absorbed by vegetables and fruits.

Owing to its great activity the normal daily requirements of iodine are almost infinitesimal, nevertheless deficiency or excess are equally disastrous. The thyroid gland distributes iodine to the body in minute quantities, but sufficient to assist the function of fats and calcium in

the system. In inland places where the soil is deficient in iodine, vegetables and fruits are poorly supplied and the inhabitants do not get enough. In such localities the thyroid gland enlarges and goitre or Derbyshire neck is produced in an attempt to accomplish the impossible. When vegetables are boiled in water, a percentage of their iodine content passes into solution in the water and is frequently thrown away. Eating fresh vegetables and salads is a sure method of obviating these losses.

Chlorine plays a leading part amongst the alkali-chlorides of the blood and tissues, and in the hydro-chloric acid of the gastric juice. Sodium chloride is its chief source. Almonds contain it.

Fluorine is a normal constituent of the bones and teeth and is not without interest as a factor in their formation. Vegetables and cereals are its chief food sources.

Silica is also found in the bones and teeth and enters the body in cereals and vegetables.

Manganese and Magnesium are found in the germ and rind of grain and in seeds, and associated with rich supplies of calcium, phosphorus, iron, potassium and sodium. The so-called "offal" of wheat rejected in milling white flour contains all these salts (*see* pp. 24, 46).

Sulphur is an active chemical element. Acid forming, antiseptic and secreted through the skin. On this account it is used in the treatment of skin diseases. It activates tissue change and purifies the bowels and the blood. In the bowel sulphuretted hydrogen is formed, which, although antiseptic, has an unpleasant odour.

The chiefs sources of sulphur are: Eggs (yolk), grain, and some vegetables; meat and the internal organs of animals. Sun-life mineral salts, absorbed from soil and air by the action of the sun's rays, and stored in the structures of vegetables and fruits, or provided in eggs, milk and flesh, as secondary products of the life of herbivorous animals, are entirely different from the same mineral salts produced in a factory. One is living, vital and active: the other is dead. Science attempts and performs wonders daily, but, unless the natural living qualities are guaranteed without reservation, substitutes for Nature are dangerous. Meanwhile Nature is a cheap and efficient mass producer, and the sun, despite irregularities of attendance, is a powerful worker and demands no pay.

CHAPTER VI

VITAMINS: GENERAL SURVEY

VITAMINS may be regarded as essences of life. Their discovery is one of the romances of modern science. Even after their existence had been proved they were described as imponderable and elusive substances, incapable of isolation and which could be neither weighed nor produced. To-day all this has been changed. Five vitamins, A, B, C, D, E, are already known and their functions demonstrated. Others are being added from time to time, one of the best known of these being vitamin K.

VITAMIN A.—An anti-infective.

Sources: Animal fats, milk, butter, eggs, fat fish such as herrings and mackerel, beef, mutton and other meat fats, and liver, fish liver oils. (Fish oils have an especially high content: heading the list are halibut and cod liver oil.) Carrots, yellow peas and freshly plucked green vegetables also contain active supplies. Carotene is a precursor of vitamin A, and is found in spinach, cabbage, sprouts, cresses, lettuce masked by green chlorophyll. The white stems of these vegetables provide little or none. Red palm oil is rich in vitamin A, being equivalent to cod liver oil. Vegetable fats and oils are poorly supplied.

Function: Produces vigour, stamina and nerve efficiency, and is essential to functions of reproduction and rearing of young. It increases the resistance of tissues to the attack of disease-producing organisms. Vitamin A is the sworn foe of every form of inflammation or —itis, from conjunctivitis, rhinitis, pharyngitis, tonsilitis, and laryngitis to pleuritis, pneumonia, appendicitis, colitis and proctitis.

Deficiency: Reduces vigour, stamina and nerve tone, and lowers the resistance of the body to the attack of

germs, which are then able to invade the tissues, and inflammations of the skin, eyes, and all the internal organs, including the heart, result. The ramparts having been lowered or breached the enemy can swarm in.

"It is essential to the orderly progression of nutritional processes at all ages. Its bountiful supply, as a bulwark against disease of many kinds, promotes vigour and stamina, and conduces to efficient and prolonged life."—(Sherman.)

"After infection has occurred treatment by vitamin A cannot restore the structures."—(McCarrison.)

VITAMIN D may be considered in conjunction with vitamin A as fats are its chief source of supply and it has similar relations to this class of food. There is this difference, however. The body under the action of the ultra-violet rays of the sun can manufacture vitamin D.

Sources: Milk, milk products, yolk of egg, fat fish and fish oils, animal fat, marrow bones, liver, kidneys.

Functions: Stimulates the growth of all bony structures, by promoting absorption of calcium from the intestine, by regulating the normal level of calcium in the blood and by fixing it in the bones and teeth.

Deficiency produces a disease called "rickets," characterized by soft bones and crumbling teeth, and a tendency to enlargement of the lymphatic glands. Hence it has been called the anti-rachitic vitamin. A well-knit, upright frame and an even set of hard white teeth, capable of standing the wear and tear of years, are not the gifts of chance but are the result of a diet adequately supplied with vitamin D and of building materials (protein and mineral salts), with which alone vitamin D can perform its function. Vitamin D is, so to speak, the bricklayer, and mineral salts, of which calcium phosphate is the chief, are the bricks.

Bones and teeth are developed in two stages. In the first stage the shape and outlines of the structure are laid down as a skeleton tissue framework, except for the fact that this framework is composed of living and elastic tissues, resembling the preliminary steel frames of modern buildings. The second stage solidifies these tissues—in the human body by filling the spaces, called trabeculæ, with lime and other mineral salts (chiefly phosphates),

much as in modern buildings the steel frame is filled with bricks or cement. The materials for both these second stages, whether in the building or the body, come from the soil and are of similar chemical nature. Those who have watched a nurse make a plaster bandage from a roll of gauze, and subsequently seen it wetted and applied, will understand the process.

VITAMIN B performs functions of great importance, both general and specialized. On this account it has been named vitamin B complex and subdivided into B_1, B_2, B_3, B_4, B_5, and Y factor.

Sources: It is extracted from the soil by plants and is stored in their *seeds*, *fruits* and *leaves*.

The chief sources are therefore:—

(1) Cereal grain, wheat, oats, barley, maize and rice.
(2) Pulses, peas and beans.
(3) Nuts.
(4) Green, leafy vegetables such as spinach, turnip-tops, lettuce, watercress and tomatoes.
(5) Yeast, eggs, milk, liver, brains and kidneys.

Special functions:

(1) To keep the brain and nervous system strong and healthy:
(2) To invigorate the heart, liver, digestive glands and kidneys:
(3) To give tone to the whole musculature: which includes the skeletal muscles or muscles of the body, and the muscular coats of the bowel;
(4) To stimulate the appetite and strengthen the taste for natural foods.

General Functions: Assistance to the other vitamins in building the body and repairing its structures.

Vitamin B is an active and supporting factor in growth and in all nerve and muscle operations. Deficiency stunts growth, and reduces bodily stamina and activity throughout life.

When eaten, vitamin B goes to those structures and organs which rule and administer other parts. These are the brain, the nerves, the heart, liver, kidneys and digestive organs and the muscles. It is the anti-lethargy vitamin. Tone, activity, decision and stamina are its characteristics.

Sources: It is secreted in milk for the support of infant mammals, as are the other vitamins (except vitamin E). Similarly grains, seeds, eggs of birds and roes of fishes contain vitamin B for the support of the future life of their species. Yeast contains it in a form portable, concentrated and easily activated into growth. Cereal grain is one of the chief sources of vitamin B and climate provides it in every country in the most suitable shape—oats in Scotland; wheat in England and temperate countries, with barley and rye as intermediaries ; maize and rice in semi-tropical countries. The whole grain, as Nature provided it, must be eaten. If any part be rejected that should be the body and not the germ or germinal layers which contain practically all the most active elements. These outer layers of grain may be called the layers of life. They are immensely powerful and resistant. Seeds recovered from the graves of Neolithic man have sprouted and grown and similar powers are attributed to grain from time to time. Wheat has, however, failed to grow after 25 years. Nevertheless, such reports are evidence that this inherent strength of the germ is not unknown to the general public, but is recognized and a matter of general interest.

Life which can resist the vicissitudes of time for even something less than a quarter of a century, which wheat can do, is obviously a vital food.

As demonstrating the powers of resistance and inherent life of the germinal layers of seeds the following extract from a report published in the *Western Gazette*, September 18th, 1936, and reprinted from the issue of the same week 100 years ago (September 15th, 1836) is of interest:—

> "In October, 1834, during excavations at Maiden Castle near Dorchester a human skeleton was unearthed from a tumulus by Mr. Maclean who found therein a portion of the stomach containing a mass of small seeds, which neither the operation of the gastric juices nor the lapse of probably 20 centuries had destroyed. Experiments were made to ascertain whether the vital principle was extinct. Professor Lindley has happily succeeded in producing plants from these seeds. The plants have confirmed the opinion expressed by the learned Professor who on a first inspection pronounced

them to be the seeds of *Rubus Idæus*, the common raspberry.

"The plants are now very vigorous and have produced much fine fruit this season and form an object of the greatest curiosity and attraction to horticulturists."

This highly interesting circumstance proves the raspberry to have been an indigenous plant in this country and an article of food.

Foods containing vitamin B have a pleasant taste and are full of stimulating juices. They produce an appetite for plain articles of diet and invigorate the digestive organs to deal with these. They require mastication and cannot be bolted. In consequence good jaw development, proper alignment and cleansing of the teeth and hard gums result.

The symptoms of deficiency of vitamin B are impaired digestion, constipation, abdominal pains, weak and irritable nerves, lassitude, inability, indecision, and general want of stamina.

Deficiency causes gastro-intestinal disorders and skin lesions and, if the deprivation is severe, mental derangement. The last sprint which wins the race: that last blind punch which decides the fight: the taut muscles which will not tear or lose their spring: strength, muscular vigour, vitality and stamina: these depend on all the vitamins acting on a balanced diet, but are the especial gifts of vitamin B.

VITAMIN C prevents scurvy and is called the anti-scorbutic vitamin. It is identical with ascorbic acid (oxidizing and reducing agent).

Sources:—

(1) Fresh green vegetables such as cabbage, spinach, lettuce and parsley.
(2) Root vegetables such as potatoes, carrots, beetroot, etc.
(3) Green leaves, young shoots of plants, grasses and cresses, dandelion, sorrel.
(4) Fresh fruits, lemons, oranges and all fruits. Orange peel.
(5) Sprouting seeds or pulses.

(6) Milk.
(7) Animal tissues: Meat, fish, i.e. when fresh and suitably cooked.

The potency of the vitamin C content of grain and seeds is greatly increased if they are moistened with water and allowed to sprout, when they are known as "pulses." Under these conditions a cheap and satisfactory supply develops. Peas, beans, and in emergency wheat, oats, barley, etc., when treated in this way become a good feeding and healthy diet, easily stored and transported. It is recorded that Daniel and the Wise Men, Shadrach, Meshach and Abed-nego, who had been chosen as king's counsellors to Nebuchadnezzar because they were "skilful in wisdom, and cunning in knowledge and understanding science", refused the court diet and elected to live on pulse and that "their countenances appeared fairer and fatter in flesh than all the children which did eat the portion of the king's meat." To gain their maximum effect pulses should be eaten raw or after not more than ten minutes cooking (*see* pp. 50, 71). Knowledge of the valuable properties of sprouting grain and seeds might be useful in times of stress or national emergency.

Functions:—

(1) Preserves the integrity of cells and ultra-cellular substances and keeps the blood pure and of proper composition so that it does not transude through the blood-vessels;
(2) Purifies the intestinal tract;
(3) Fortifies the tissues to resist the attack of germs;
(4) Assists in the building of bones and teeth.

Deficiency leads to hæmorrhages, unhealthy gums, sallowness and affections of the skin, lowers tissue resistance to germ infection, and causes rheumatism. Tubercular and streptococcic infections of the bowels supervene, the gums bleed, and the teeth become loose. These conditions constitute scurvy.

Vitamin C is the least stable of the vitamins. It is easily killed by heat, cold, desiccation and many chemicals. Prolonged over-cooking and boiling are certain death.

Vitamin C is secreted in the milk of all mammals, whether herbivora or carnivora, i.e. whether acquired

directly from eating vegetation or indirectly from eating flesh, but the milk of animals fed on dried grasses and on grasses fertilized with certain artificial manures contains little or none. Infants fed on boiled milk develop scurvy and in places where fresh pure milk is not available, as in the tropics, fruit juices, vegetable juices or red meat juices must be added. The Masai live on a mixture of fresh blood and milk and are peculiarly free from vitamin C deficiencies.

VITAMIN E may be regarded as the vitamin of fertility or the race propagator. It maintains functional efficiency of the reproductive system. Without it few children are born, great difficulty in labour ensues and the offspring frequently die. It is remarkably stable and resists heat and acids.

Sources:—

(1) The germ and outer layer of grain such as wheat, embryo wheat, germ wheat oil, oat oil, maize embryo, rice polishings and pea seeds all have a very high content.
(2) Lean animal flesh, protein.
(3) Fish liver and cod liver oil.
(4) Green leaf vegetables—lettuce contains a high content.

It is not present in milk, which is the food of infancy.

Deficiency results in sterility, maternal mortality from difficulty in labour, and deformities in the offspring which are not properly made and die. In the male, degeneration of the testis results. In the female the ovaries are undamaged and conception may take place but either the fœtus is absorbed or grows abnormally into deformity.

Vitamin E is probably a complex with two parts: One governing reproduction and the other stimulating lactation. In 1931, two women who had experienced four and five miscarriages respectively were treated with wheat germ oil and in both cases a successful pregnancy resulted. Of eleven sterile but healthy cows which received ultra-muscular injections of germ wheat oil, nine cases of pregnancy ensued.

VITAMIN K, the blood-clotting vitamin, is one of the more recent vitamin discoveries.

Sources: Liver, and green, leafy vegetables.

Deficiency produces a condition resembling that found

in bleeders. The blood does not clot. Consequently a torn or cut artery allows all the blood to drain from the body.

Summary

Each vitamin has a specific action on certain body tissues: —

A to epithelium and nerve.
B to gastro-intestinal tract, nervous system and skin.
C to the cement substance which binds the cells together.
D to the bones and teeth.
E to the reproductive system.
K to the blood.

(*See* McCarrison's Cantor Lectures, etc.)

CHAPTER VII

EVIDENCE

IN reviewing the evidence of experiment and experience as to the value and functions of the vitamin content of food, the subject must be regarded from two aspects: —

(1) The production of optimum growth, health and vitality.

(2) The prevention and cure of deficiency diseases.

Between the peaks of perfect health and the quaggy depressions of disease range the wide slopes of deficiency, unrecognizable except as subnormal health, and generally accepted by the struggling masses as either natural or inevitable. A boy at school may be condemned as a "slacker," a young married woman may wreck her whole life's happiness and be accused of mental instability, when in reality both are suffering from vitamin insufficiency. Food is the dictator of capacities and the ruler of temperaments and governs every cell in the body, regulating its resistance to disease and stimulating and supporting its activities, or reducing it to lethargic incompetence.

Moreover, this dependence on food does not start with birth but with conception. The primary cells at fusion blend the dowers of sufficiency or insufficiency. From that moment the mother's tissues must meet every need of the child growing in her womb, or it will be born to deficiency. This is not an idea but a fact proved by experiment. Bitches were fed on diets full of vitamins A and D and on diets wanting in these vitamins. The results were apparent in their puppies at birth. The first were healthy, well-grown and full of vigour and activity, the others already showed signs of rickets. A rachitic diet, i.e. a diet which must eventually produce rickets, varied in its results: where the mother had received full supplies, the onset of

the disease was much delayed. Vitamins stored before birth enabled tissues to carry on for months in the face of complete vitamin starvation and provided for quick recovery the moment supplies were forthcoming. Reserves ward off the onset of symptoms until the boundaries of deficiency have been reached, while hard physical work, by using reserves, exposes the deficiency earlier than do sheltered and sedentary occupations. Like the shortness of breath literally at its last gasp or the bank balance so low that the first emergency cheque is returned marked "no assets," any call for sudden output demonstrates the deficiency. The human body is similarly affected as proved by numerous experiences. In a camp where the diet was deficient in vitamin C, soldiers and labourers developed scurvy earlier than clerks and those engaged in sedentary occupations (*see* pp. 48, 52).

In order to judge the evidence and comprehend the experiments and experiences on which knowledge of food function and food values is based, it must be borne in mind that man is a mammal with physiological processes similar to dogs and cats, rabbits, guinea-pigs, mice and rats, and that by analogy, what applies to them will apply to him also.

Major-General Sir Robert McCarrison recently published the results of experiments made by him in India with rats fed on a Sikh and on an English diet.

The Sikh is a fine upstanding fellow, full of vigour and courage, and a notable soldier. He lives on a sparse diet of natural foods as follows:—

(1) *Chapatties* or cakes made of whole wheat grain eaten lightly smeared with butter or oil.
(2) Sprouted Bengal grain or pulse.
(3) Raw fresh vegetables.
(4) Milk.
(5) Hard crusts of rough bread.
(6) A small ration of meat with bone once a week.

Rats fed on Sikh diet increased in weight, had glossy coats, flourished in health, and were sexually active and prolific. None died from natural causes, nor were there any cases of illness or of maternal or infantile mortality.

Rats fed on English diet during the same time, and under precisely similar conditions, were thin, stunted, had

ragged coats and were nervous and irritable. Sterility was common and short families the rule, divorces and family quarrels were frequent and discontent appeared to be general. Many became ill, some died, infantile and maternal mortality were high, despite the reduced number of offspring.

Both diets provided enough to eat freely, but obviously the English diet was deficient in qualities necessary for growth, vigorous health, steady nerves and procreation. Not quantity but quality was deficient, and it is interesting to note that not only optimum growth, physical vitality, and mental and moral vigour, but infant and maternal mortality, depend on the ingestion of food containing certain properties.

Probably no single measure offers greater possibilities for providing a safe and easy passage through childbirth, and for reducing the mortality of mother and infant, than the adoption of a simple diet of living food. Unfortunately, no spectacular results would be obtained, because a generation must pass before improved results became fully apparent. In adults the malformations and contractions of deficiency are fixed on the bony frame, and nervous instability and want of muscular tone have become constitutional (*see* pp. 57, 59). Nevertheless, the mother would gain much, and her offspring more, while the possibilities of improvement to future generations are immense.

The following experiments demonstrate how easily the life or vitamin content of food is damaged and killed:—

(1) Mice fed on a correctly balanced mixed diet of prepared proteins, fats, carbo-hydrates and mineral salts neither grew nor lived. On the addition of fresh milk to this diet they both grew and flourished, but when the fresh milk was boiled before addition, growth ceased, the animals became ill and died. This shows that a correctly balanced and sufficient diet is not enough. Vitamins must be present: the food must be alive. Fresh milk supplies these requirements and boiled milk does not do so. All foods artificially prepared or subjected to extremes of heat and cold must be regarded as devitalized and possibly dead.

(2) Pigeons fed on white rice became ill and paralysed and died. When the polishings removed in the production

of the white rice were added, the ill and paralysed rapidly recovered. Obviously something necessary to life and health is contained in rice polishings. That is vitamin B.

The above experiment was repeated but before addition the rice polishings were mixed with soda and subjected to great heat. The addition of polishings thus treated had no effect. The pigeons still became ill and died. Prolonged cooking, great heat and the addition of chemicals weaken or kill the vitamins in food.

(3) Rats fed on a diet of lean meat and whole wheat grew and flourished and brought up a plentiful and healthy offspring, but deprived of these foods the majority were sterile, and any young born grew deformed and died. Vitamin E controls fecundity and the processes of birth and in view of our maternal mortality and declining birth-rate this experiment is suggestive.

(4) Guinea-pigs fed on dried oats and boiled milk developed scurvy and died, while on fresh oats and unboiled milk excellent health was maintained. Hence scurvy is due to the death by chemicals, desiccation and heat of some living quality in food. Vitamin C, the antiscorbutic vitamin, has been killed.

CHAPTER VIII

MORE EVIDENCE: VITAMIN DEFICIENCIES

Deficiency of Vitamin A (*see* pp. 33, 34)

THIS was common in the prison camps of the Great War. Russian peasants, already ill-supplied, developed acute symptoms during the great Easter Fast.

In Japan, China, the Dutch East Indies and Guatemala epidemics of night blindness have followed diets deficient in fats and especially in those undergoing hard physical labour. In Continental hospitals and orphanages substitution of fabricated fats for butter has produced similar results. Newfoundlanders suffer from it in winter and treat it with cod liver oil. Two ounces has restored normal vision in twelve hours. The Newfoundlanders regard the liver of a gull or puffin as being more efficacious. Milk, ox liver and vegetables produce rapid cures. Hippocrates recommended that in cases of night blindness the patient should eat the largest ox liver which could be found, raw and dipped in honey. Failure to treat the onset of night blindness with abundance of vitamin A results in progressing disease. Inflammations of the cornea proceed to ulceration and necrosis, and ultimately the eye is lost. Inflammations of mucous membranes, stones in kidney and bladder and other serious symptoms supervene.

Deficiency of Vitamin B (*see* pp. 35, 37)

Probably about the time of our Tudor Kings the fashion arose in China of removing the germ and germinal layers of the rice grain. These are the layers containing vitamin B and the process of their removal is known as polishing. Before long a new disease appeared as a result of this polishing: the muscles and especially the cardiac muscle

degenerated, the limbs became swollen and paralysed, heart disease and dropsy ensued, and in serious cases death resulted.

This train of symptoms is now known under the name of Beri-beri and is due to want of vitamin B, which was thrown away in the discarded polishings. Millions of Chinese men and women have died of beri-beri since that fashion started (*see* p. viii), but as the removal of the rice polishings causes the disease so will their addition effect a cure.

Some three generations ago the English nation took a similar step in rejecting the germ and germinal layers of the wheat grain from their staple food, white bread. Owing to the Englishman's high standard of living and widely spread diet this step neither has, nor could have, such disastrous results as overtook the Chinese peasant. Nevertheless, the loss of stature, tone, muscular activity and stamina must be considerable. Constipation due to loss of muscular tone in the bowel is prevalent to-day, as is evidenced by the use of costly medicines to drive the relaxed bowel to perform its function. Like flogging a weary horse the results are unsatisfactory and often disastrous. Operations of the greatest magnitude have been devised for the cure of this condition of bowel stasis. Unless weakness has developed so seriously as to be beyond recovery whole grain wheaten bread, by stimulating muscular tone, will enable the bowel once again to pass on its contents. A teaspoonful of germ and outer layer or "offal" taken in the morning is a stimulating laxative, though in this concentrated form to be used with care. Any attempt of confirmed and habitual white bread eaters to suddenly adopt whole wheaten bread is to be deprecated. The step must be taken with caution. A few shaky and carious teeth are inadequate for mastication. Atonic bowels and long impaired digestive juices will fail to complete digestion.

Success may crown a good denture and a common sense and sustained struggle. In that case tone will return to the muscles, brain, nerves and internal organs, and be shown after a time by renewed health, strength and activity. With the young the attempt should be made.

In the Dardanelles and Mesopotamia campaigns British

soldiers suffered from beri-beri due to inadequate supplies of vitamin B in their food. Indian troops escaped owing to their diet of *atta* (coarse whole ground wheat flour and dahl or dry pulses). At Kut-el-Amara an unconscious experiment took place between December, 1915, and April, 1916. During the siege beri-beri occurred amongst the British troops, but Indian troops escaped. When white flour became no longer available, *atta* (rough ground grain) from the Indian Contingents was served to British troops, and beri-beri disappeared.

In Norwegian ships beri-beri was a rare disease until 1894, when white flour was substituted for the mixture of rough ground wheat and rye previously used. The following diagram shows pigeons fed on polished rice and suffering from polyneuritis:—

Opisthotonus or head retraction

Same pigeon the day after receiving a curative dose of yeast preparation

Emprosthotonus

[*From Medical Research Council's Report on Vitamins, p.* 124]

An old sea captain, refusing "new fangled reforms" which had made white flour compulsory for sailors at sea, shipped sufficient of the old rye flour for his personal needs. The voyage was a long one. The men developed beri-beri and were cured by doles from the captain's supplies as long as these lasted. When only a few bags remained the captain was compelled to husband them in order to maintain his own health and fitness for duty.

Deficiency of Vitamin B_2 (*see* p. 35)

Rats and mice, after six to ten weeks on a diet deficient in vitamin B_2, showed general wretchedness and skin lesions in many cases. All lesions were curable by foods containing vitamin B_2. The more fat ingested the more vitamin B_2 is needed (McCarrison).

Pellagra was apparently unknown to the physicians of antiquity. A Spaniard, Casel, described it in 1735, and gave a full specification of the poor diets customary in the pellagrous districts of Andalusia, actually ascribing it to faulty nutrition. Subsequently it has been described in Italy, France, Hungary, Roumania and Turkey. Pellagra became serious in the United States about 1909. In all these countries it was coincident with a poor and monotonous diet. Pellagra and maize diets are intimately associated, and doubts have been raised as to whether the disease is due to B_2 deficiency or to a positive toxic factor in maize. It has followed the adoption of maize as a staple food in country after country but has occurred where maize is not eaten. Removal of a dietary factor in the milling of maize is the generally accepted cause. Yeast, milk and mead added to the diet effects a cure. In orphanages, prisons and institutions the addition of milk and eggs prevented recurrence. In 1915, eleven convicts accepted the offer of a free pardon on the conclusion of an experiment restricting their diet to the endosperm (inside) of maize. After five and a half to six months they developed pellagra symptoms. Restriction of proteins has been noted in pellagra diets and maize has a low position in protein values. Yeast is the cheapest and most effective preventative of pellagra.

Deficiency of Vitamin C (*see* "Scurvy," pp. 37-39)

The history of scurvy is a long one. It was always recognized as due to want of something elusive in food, connected with its freshness. The list of reputed cures equals in length the history of the disease. The juice of citrus fruits has been regarded as the antiscorbutic *par excellence*. Since coming into general use the potato serves many food purposes, including the provision of vitamin C. For flavour, vitamin content and food value it should be cooked in its skin and peeled subsequently.

Sailors, soldiers, explorers and armies in the field dreaded scurvy. When fresh foods failed it became a terrible scourge. Lime juice, laced with rum to overcome the sailor's prejudices, was given as a preventative to crews after ten days at sea and the custom was continued by Board of Trade regulation down to recent times. A generation ago, before fruit and vegetables became so

generally available all the year round, as is the case to-day, deficiency of vitamin C was common in meat eaters, heavy drinkers and those who were either ignorant of the need or too poor to supply it. Dark rashes developed on the leg suddenly and without warning, due to extravasation of blood, through innumerable small arteries and veins. Fortunately, this alarming experience usually resulted in a visit to the doctor and a change of diet with disappearance of the symptoms.

When an attempt was first made to kill the tubercle bacillus and other germs in milk by boiling, many bottle-fed babies developed scurvy-rickets from death of the vitamin content. The more carefully the milk was sterilized the more disastrous the result. Fresh unboiled milk cured the disease, as also did addition to the sterilized feeds of fresh fruit, vegetable and red meat juices and cod-liver oil (*see* pp. 39, 45, 65, 67). Curran, 1847, mentions two hopeless scurvy patients who received ½ oz. of lemon juice with sugar and water three times daily for two days, when they sat up and took food with cheerfulness. In a severe case the eating of a whole rhubarb tart produced decided improvement. During the years from 1750 to 1850 numerous records show that lemon juice kept the sailors healthy, and that ships sailing without it were sometimes decimated by scurvy. Between 1860-70 lime juice was substituted. The lime proved definitely inferior. On an Arctic expedition equipped with all improvements and plentifully supplied with lime juice, scurvy broke out. The same result occurred on many long voyages about this time. This was due to overlooking the fact that the Mediterranean lemon and the West Indian lime had been regarded as interchangeable. In addition to vegetables and fruits "scurvy grass," a small plant frequently found growing near the seashore, figures amongst the records of scurvy cures. In 1734 a sailor in the Greenland ships was so disabled with scurvy that his companions left him to die on a lone island. The poor wretch had quite lost the use of his limbs and could only pull himself about on the ground. The old record states: "This he found covered with a plant which he, continually grazing like a beast of the field, plucked with his teeth." In a short time he became perfectly recovered. On his returning home the herb was found to be "scurvy grass."

Although the potato has a comparatively low anti-scorbutic power, outbreaks of scurvy during potato famines in Ireland (1847), Norway (1914), Glasgow, Manchester and Newcastle (1917), prove that it suffices.

Onions are fairly potent and have an especial significance as they can be eaten raw or cooked and are palatable and easily transported.

As an instance of the food and vitamin C value of *germinated pulses and cereals* (a fact not sufficiently recognized in this country), a batch of Serbian soldiers (1918) were treated, half on 4 oz. fresh lemon juice, and half on 4 oz. dry weight of germinated haricot beans. The beans were boiled for ten minutes. The progress of the "bean" party was, if anything, the more rapid.

Dahl forms a staple article of the native Indian diet and had the knowledge of its antiscorbutic value after germination been applied in Mesopotamia in 1915 the terrible wastage from scurvy in that campaign might have been averted.

Beer and malt: Captain Cook was a great believer in the antiscorbutic virtues of a fresh infusion of malt (sweet wort). On his second voyage (1772-75), the amazing record of one death from sickness was established. He took large quantities of malt of which he made sweet wort, and any man showing signs of scurvy was given two or three pints daily as the surgeon found necessary. Sir John Pringle, 1776, notes that a "small brisk acidulous liquor" from rye meal was served in Russian prisons as an antiscorbutic.

Fermented liquors from germinated seeds have been held in high esteem for the prevention of scurvy. Kaffir beer, made from partly germinated Kaffir corn and maize, and consumed quickly after preparation, has proved of value in the Rand mines, and when replaced by ungerminated substitutes scurvy broke out.

Dried vegetables have frequently been tried and found useless for preventing human scurvy. Owing to their portability they have on many occasions been supplied to armies and other large bodies of men, but always with disastrous results. Chief Surgeon Kramer, of the Austrian Army, 1720, in the Hungarian campaign was confronted with a widespread outbreak of scurvy. He applied to Vienna for help and advice. Consignments of dried anti-

scorbutic herbs were despatched to his aid and were given a prolonged trial with the result that thousands perished. His report had been translated by Lind, 1757:—

> "The scurvy is the most loathsome disease in nature, for which no cure is to be found in your medicine chest; no, not in the best furnished apothecary's shop. Pharmacy gives no relief; surgery as little. Beware of bleeding; shun mercury as a poison. You may rub the gums, you may grease the rigid tendons in the knee to little purpose. But, if you can get green vegetables, if you can prepare a sufficient quantity of fresh noble antiscorbutic juices, if you have oranges, lemons or citrons, you will, without other assistance, cure this dreadful disease."

Dried vegetables were frequently and repeatedly tried in the Navy and invariably failed.

Dried fruits have shown distinct though feeble antiscorbutic properties. The dried tamarind, cocum, mango and anola are sold in the bazaars of the East and possibly owing to their acidity preserve some antiscurvy properties for a time, though steadily waning as the drying process progresses.

Meat is much less potent than vegetables or fruit as an antiscorbutic. Three patients in 1847, who consumed ¾ lb. of meat on five days in the week developed scurvy.

Sir Gilbert Blayne (1781) relates an incident with the fleet at Barbadoes, where a party of soldiers serving as marines were sent to an army hospital in which no animal food was allowed. These men recovered more quickly than others freely rationed on meat.

If the meat ration is large enough, however, scurvy is averted—8 lb. of fresh venison daily per man, 4 lb. per woman and 2 lb. per child was found adequate by the Hudson Bay Co. in 1876. Nansen and his party, 1895-96, with no lemon juice and no fresh vegetables, kept themselves healthy on fresh walrus and bear meat.

The following interesting incident is reported to have occurred at Kharborova (1900), where six Russian priests arrived with one small boy. The priests, by their religious vows, were prevented from eating the fresh meat available. They subsisted on salt fish and there were no vegetables.

In nine months the little boy was found to be the only survivor. He had eaten freely of reindeer meat and had buried all six of his late masters in the snow.

The following incidents demonstrate how completely prolonged cooking kills vitamin C.

In a camp in Scotland 82 labourers developed scurvy on an eminently satisfactory diet. On investigation it was found that the meat and vegetables had been stewed for five hours. Men engaged in sedentary occupations were affected later and less severely.

In France during the War a Kaffir labour battalion developed 142 cases of scurvy. The ration contained adequate fresh vegetables and meat, but these had been stewed for three hours.

Deficiency of Vitamin D (*see* pp. 34-35)

Especially disastrous during pre-natal life and in early infancy, i.e. while calcium metabolism is most active and the bones and teeth are in process of formation.

The infant suffering from vitamin D deficiency is pale and languid; the head large and covered with clammy sweat; the abdomen bulging. Sleep is fitful and movements are painful. When lifted, whimperings or shrieks proclaim the pain caused by bending of soft bones. Under the weight of the atmosphere, the chest becomes "pigeon-breasted" from pressure on inadequately calcified ribs and sternum. Respiration is in consequence hampered, less air can be inspired, and the respiratory passages become narrowed. The first cold results in bronchial congestion from inability of the deformed chest to eject phlegm and to aerate the lungs. If placed on its feet the child becomes bandy-legged or knock-kneed and pelvic deformity is produced. The teeth are soft and the gums septic. When the disease has become fully established, secondary infections intervene from swallowing and inspiring germs. Lowered tissue resistance facilitates their establishment and growth. Tonsillitis, enteritis and bronchitis result. Toxins are produced and absorption from the swollen bowel poisons the whole system. Death may supervene from innumerable complications, bronchitis and inflammation of the bowels being the commonest. Should the diet be changed in time to avert the supreme disaster,

nevertheless permanent damage has been done and a life has been handicapped from the start, and must drag its way at the tail of its fellows stunted and deformed.

No one need have rickets. Every pigeon-chested or bandy-legged man or woman, stunted by rickets, is a walking testimonial to ignorance.

Happily, rickets is less prevalent and milder in type than in the middle of last century, when on the Continent it was known as "The English Disease." Nevertheless, carious teeth doom 95% of the population to swallow a host of germs with every bite of food. It has been said that all diseases originate in the mouth, and in one way or another, with few exceptions, that is true.

Towards the end of the last century a famous London surgeon proved, by post-mortem examination and histological demonstration, that the cause of death in lion cubs born in the Zoological Gardens was rickets. Though healthy at birth, after a few months gambols ceased, bones grew bent and they sank and died. Cod-liver oil improved the condition but was inadequate. The reason was discovered later. The lioness had no milk with which to suckle her young. A deficiency diet composed of a mush of lean pounded horseflesh had been provided.

In adults vitamin D is still essential to calcium metabolism. Milk, vegetables and cod-liver oil have arrested dental decay and diminished the incidence of fractures in boys at school.

Carious teeth produce disease and are largely preventable. Dentures are a serious handicap to life's activities. Both may in emergencies prove a deciding factor. Recently a gallant youth plunged into the sea to save a young woman. He was dragged out lifeless, having swallowed his false teeth.

Fractures are unnecessarily prevalent amongst civilized communities.

All such disabilities could be materially reduced by a diet containing plentiful supplies of minerals and vitamin D. Girls and women are the most common sufferers from inadequacy, as their calcium needs are the greatest owing to the demands of puberty, pregnancy and lactation and to the fact that at these times they tend to stay indoors, and for psychological reasons to eschew fats. In

serious cases such as occurred in post-war famine-stricken Austria, the bones bend and pelvic deformities result, which in case of recovery are sufficient to make parturition difficult. This re-absorption of lime-salts is called osteomalacia. About the end of the 15th century it is supposed to have caused the extinction of a Norse colony founded by Eric the Red. Lack of sunshine in such a high latitude needed adjustments in the dietary which were, in all probability, not taken.

Insufficiency of the ultra-violet rays of the sun must be compensated by sun-life food or sun diet. In India and other Eastern Countries osteomalacia is common amongst the well-to-do, though not amongst the poorer labouring classes, owing to the custom of purdah or seclusion amongst women. In Kashmir three cures have been reported for "trouble in the bone."

Baramulla earth, a clay containing calcium phosphate:
Pills made of fish and liver;
Rubbing the body with mustard oil and exposing it to the sun's rays.

Every scientific requirement for the cure of calcium and vitamin D deficiency is met by this treatment. Not only are phosphates and vitamins added to the diet, but friction with mustard oil draws blood into the skin and thereby secures the maximum effect from the ultra-violet rays of the sun. Sunshine and ultra-violet irradiation through the winter months undoubtedly prevent all bone softening diseases by manufacturing vitamin D in the body. Artificial radiation, however, is expensive, and needs careful supervision, besides entailing travel and loss of time on the part of mothers, who must attend regularly. Moreover, vitamin A is as necessary as vitamin D and can only be provided by food and cod-liver oil.

Tetany also results from want of vitamin D.—It is an infantile disease associated with rickets, and resulting in spasms in the larynx, hands and feet, and generalized convulsions. Rickety children are always nervous. This increased excitability of the nervous system has been called "latent tetany." Deficiency of calcium in the blood serum and of vitamin D in the food are usual findings. Adequate doses of cod-liver oil cure the condition if administered in

time, and if used as part of the diet prevents both rickets and tetany. A real cure can only be assured by supplying vitamin D in some form sufficiently strong to restore normal calcium metabolism.

As an illustration of the simplicity of the body's needs the following is interesting: A bottle-fed baby passed to a mixed diet of whole grain bread, milk, dairy butter, vegetables and fruit, fish and meat. Personal inclination resulted in grain, milk and vegetables becoming the main articles of diet. The intake milk advanced to ten glasses daily.

At 14 this lad was strong, healthy and 6 ft. 3½ in. in height; *at 15* he boxed and ran for his school.

Deductions based on experiments, and analogies drawn from experience, especially when food is the subject, are apt to arouse prejudice. The generality of people dislike discussion about food and recent discoveries which suggest a change in habits already growing fixed. Moreover, dentures, carious teeth, weakened digestive juices and atonic bowels make the transition difficult. Pressed by argument and pursued by cogent reason the issue is side-tracked. Scorn and ribald allusions to "cranks," "faddists" and "monkey foods" are used to provide a diversion. Comparison with other races is met by the boast, "We have the highest standard of living in the world," and suggestions for reform elicit the retort, "What was good enough for my father is good enough for me."

It is overlooked or forgotten that forebears were probably brought up on a farm and on the fresh foods of Nature before migrating into town life. Since then a generation has passed into changed conditions. Labour in sun, wind and rain has become work in factory or office. The fresh foods of Nature have been displaced by imported food-stuffs, chilled, frozen, tinned and manufactured.

Food is the sustenance of life and the source of its growth, energies and health. However great the crisis, however urgent political issues, the qualities of food and their adequate supply must always be the most urgent national problem.

CHAPTER IX

DEFICIENCY DISEASE

DEFICIENCY DISEASE is the name given to conditions produced by lack of vitamins in the diet. They are due not to want of food but to loss of the living qualities in food due to removal or destruction of vitamins. On the analogy of house building the materials are on the job, but the workers have been sent elsewhere or killed.

Deficiency diseases are known as:—

Declared or major deficiency disease when a defined train of symptoms has developed such as can be recognized and named as an entity. Scurvy, rickets, tetany, beri-beri or pellagra are examples of major deficiency diseases.

Concealed or minor deficiency disease is an indefinite entity characterized by stunted growth: a tendency to infection of the tissues by germs due to their lowered resistance; to nervous irritability, loss of grit and brain power: lassitude; and general want of stamina. The ramifications of concealed deficiency disease are endless: Brain, heart and muscle are weak; ordinary exertion, mental or physical, is a tax: weak nerves rush every fence and force is expended before the need has arisen; depleted reserves result in the inevitable fall. Consequent on failure due to the fatigues of insufficiency, the mind becomes introspective and depressed. Attempts are made to restore self-esteem by boastings, or by accusations laying the blame on others (masters, parents or families). Compensation for defeat is sought in wild and unsustained enterprise which only too often ends in crime.

Minor deficiency diseases are widespread in this country, stalking the land under unexpected disguises. Despite poverty, ignorance of the body's need for Nature's living foods is the chief cause. Dead foods are doubly disastrous, for they clog the system with poisonous by-products and produce disease more quickly than does the need which must eke out existence on a sparse natural regimen.

Deficiency disease will disappear when the nation renews its demand for plain fresh foods and its women learn the few necessary basic principles of cooking.

CHAPTER X

FOOD DEFICIENCY AND THE TIME FACTOR

THE future is to the young, yet on this basic question of Food the present is vital.

PRENATAL DEFICIENCIES (*see* pp. 25-26, 43, 59, 63-65. *See also* "The Mother," pp. 60-62; "Mother and Child," pp. 63-65).

At the Age of One Year:—

(1) Bones have been formed and the growing ends are active and producing healthy extension or they are soft, puffy, swollen and inactive.

(2) The first batch of milk teeth have been cut or dentition has been delayed.

(3) Good bone growth has bridged and buttressed the formation of the jaws and nasal passages in such a way as to allow free passage of air with the mouth closed, or narrowing has made the child a mouth-breather.

(4) The brain, the glands and the main central organs, on which not only individual health and efficiency, but also the future of the race depend, have had their foundations well and truly laid, or insufficient materials in the hands of a paucity of feeble workers have jeopardized the structure from the beginning.

At the Age of Two Years:—

(1) All the milk teeth have been cut, or dentition is delayed.

(2) The mouth is clean and the breath is sweet, or heavy breath, commencing decay in teeth, and puffy gums portend the onset of oral sepsis.

(3) Spine, leg and pelvic bones have remained firm beneath the body-weight, and ribs and chest have resisted the atmospheric pressure (14 lb. to the square inch), or the frame shows signs of distortion.

(4) Adequate development of jaws and nasal bones allows free breathing through a closed mouth, or inspiration through the open mouth of air, unwarmed and unfiltered by the action of the nasal flues, has resulted in

septic tonsils and nasal passages blocked with germ-laden mucus.

(5) The cranial bones have consolidated and are capable of protecting the brain from injury, or a thin, domed vault, covered with blue veins, proclaims that inadequate armour has been provided to protect the centre of all intelligence and nervous control.

At the End of Two Years.—The house is complete in miniature. Solid foundations, strong walls, and a weather-proof roof advertise a sound job, or settlements and cracks denote faulty material and scamped workmanship.

At the Age of Three Years:—

Builders and workmen, proteins, fats, mineral salts and vitamins have completed the first stage of their work and the result shows either deficiency or adequacy.

Major deficiency will have produced mal-developments or definite deformities due to rickets: Splints, prolonged medical treatment or surgical operations are then necessary, but perfect recovery is impossible.

Minor deficiency often passes unnoticed, except to the experienced eye. Its defects are difficult to assess when hidden in deep-seated glands and the great central organs. The most common error, lack of building and protective foods associated with excessive carbo-hydrate, produces a fat, flabby child which is its mother's pride. Colds, bronchial attacks and attacks of bowel inflammation are regarded as ordinary childish ailments (*see* pp. 52-54). That teething was late and walking undertaken after a long period of disinclination: that sudden movements are resented or cause a fit of crying temper; that during unrestful sleep the head and hair are damp with clammy sweat — are not recognized as signs of disease. Clinical examination discovers cumulative signs of malnutrition. An X-ray photograph clinches the diagnosis. Hidden beneath chubby wrists and ankles, the swollen growing ends of bone shafts, tumid and unhealthy, are displayed. Happily, treatment can do much. Milk, porridge, whole wheaten bread and vegetables, fruit, fish, meat juice and cod-liver oil, with marrow bones, i.e. protein fats, mineral salts and vitamins, instead of starch, sugar and devitalized foodstuffs, will, if the impaired digestion can be persuaded to deal with them, result in rapid improvement.

Nevertheless, and especially in infancy, deficiency means that a life has been handicapped. The extra weight carried may never be recognized, but it is there in some form or another and will produce results. In times of crisis: in illness, work and emergencies: in school sports, in the choice of a profession, in marriage and in old age, the additional load, whether small or great, will produce its effect. Something less than the best which might have been, and could have been, has had to be accepted. Want of the fat vitamins A and D will have lowered tissue resistance and restricted bone growth.

Loss of vitamin B, discarded with the germ and outer layer of grain, has deprived the brain, the nerves, the heart and the major organs of their stimulating commandant. Development has been checked at its most important point. Nerve starvation has resulted in want of stamina and a highly strung temperament.

Children quickly form habits. Likes and dislikes are strong. A taste for sweets and pappy foods is not readily broken by those who have allowed or encouraged its formation. Great issues of policy with end-results of unforeseen magnitude are fought out in the nursery, be it a cottage attic or a bath-room suite. Happy, perchance, are those who are forced by working needs to the rough but toothsome foods of Nature and to habits of order and discipline.

Food is the Foundation of Life and Health

No young couple should marry without a sound working knowledge of food, its varieties and their functions. In practice, the subject is simple and a small one. A short course of instruction would suffice. Not more than a fortnight need be necessary. The rewards in health, in savings of labour and money, and in improved chances of family happiness, are ample to justify such a small premium of sacrifice.

CHAPTER XI

THE MOTHER

AFTER a period of neglect, nutrition to-day attracts an increasing public interest. For the mother who is housekeeper and cook the choice and methods of preparation of food are vital to the family.

Major-General Sir Robert McCarrison's Cantor Lectures delivered before the Royal Society of Arts, February 10, 1936, and published under the title of "Nutrition and National Health" should be widely read. Scientific facts based on data derived from experiment and experience are stated in these lectures with the clarity of profound knowledge. Particular stress is laid on the "mild" deficiency which, short of producing symptoms of definite diseases such as scurvy and rickets, nevertheless "is responsible for a large proportion of the ill-health in this country."

That ignorance and not want is often the cause is also emphasized in connection with maternity mortality "because in some places maternal mortality is higher amongst well-to-do women than in women of the poorer classes. . . . For some women amongst the better classes have no idea how to feed themselves properly during or after pregnancy." His conclusion on this subject is that the best diet for expectant mothers is made up of "whole cereal grains, milk, milk products and eggs, with fresh green vegetables and fruit in abundance."

The conclusions reached after prolonged experiment and investigation by the Medical Research Council, and published in 1933 and 1936 by His Majesty's Stationery Office, should be read and acted upon.

The dietary is of vital importance during pregnancy and lactation. With the exception of women who deliberately eschew motherhood, and it is doubtful if any normal woman ever has done that, girls from puberty and women until the menopause should regard themselves as the

trustees of posterity. It is a responsibility thrown on their shoulders by the chance of birth, and from which they cannot escape if a full, complete and happy life is desired. For this purpose Nature has given them hardihood of body and a fearless individuality, and these great qualities must not be used to attract attention or to advance in the van of illogical fashion, but must be schooled to preparation for responsibility.

Once puberty has established its regular functions girls should be taught the obligations of their sex and the nobility of its duties.

Plainly, yet without unnecessary detail, every young woman should clearly understand that from conception until birth every child depends solely on its mother's blood and tissues for all its needs, and that her diet is the only source of supply for both of them. This fact must be clearly stated and understood, viz.: that if, owing to ignorance, or at the dictates of fashion, or to suit some temporary convenience, a mother denies her body the sun-derived natural foods essential to tissue life, then her unborn child must be branded at birth with the stigmata of deficiency. The mother's diet must not only support her own good health, and fit her for motherhood at the end of nine months, but for every day and hour of that time must support the growth and development of the new life for which she has become responsible. Ignorant denial by the mother of her unborn child's needs is a crime. So little knowledge and goodwill are required. Deliberate denial is diabolical.

Societies, supported by public opinion, rightly protect dumb animals, yet no dumb animal is so dependent and so mutely helpless as the unborn child, and, moreover, animals can be put out of their misery, but human beings must drag their deformities through long lives. It should be plainly understood that the deficiencies of intra-uterine life are permanent. Not only is bone-growth arrested, not only are teeth laid down in bad material, but brain tissues and glands are starved at the crucial moment when their foundations and design are being determined. Nothing can be more important than these nine months of intra-uterine life. On them depend the future of the individual and of the race, and when deficient nations meet efficient nations, deficiency must accept its fate.

Equally with girls, boys at school should be made to understand their responsibility both to themselves and the future. Stature, girth, energy and stamina are never far from a boy's mind, and that these can neither be produced nor supported on "squish" and the products of the tuck shop, is an opinion already held. Facts proved by scientific experiment and demonstrated by the experiences of men down the past should be placed before every lad, and the advantages of a plain, natural diet should be proved beyond doubt under his eyes by the effects of food on animals placed in his care. Visions of stalwart youth and vigorous manhood make an instant appeal to every boy. The lesson, once learnt, would, in later years, weigh in the choice of a wife and would stimulate an intelligent interest in the upbringing of children.

Both sexes would benefit in personal health, the miasmas of deficiency would be swept away, and a bigger and tougher generation would find their pleasure in responsibility and step out to command ever-widening destinies.

CHAPTER XII

MOTHER AND CHILD: PITFALLS AND DEFICIENCIES

DURING pregnancy there are two to be fed and one demanding building material for complete construction. Any item not "on the job" must spoil the result (*see* pp. 16, 41-43).

THE ESSENTIALS ARE (*see* p. 16):—

(*a*) *Protective foods.*—Fresh milk, fresh butter, whole grain bread, biscuits and cakes, porridge, etc., cheese, eggs, green, leafy vegetables, salads of lettuce, cresses, tomatoes and fruits.

(*b*) *Building foods.*—Milk, eggs, wholemeal bread, fish, fowl and meats.

(*c*) *Energy producers.*—Fats, starches and sugars.

As an Insurance against Vitamin Inadequacy: Fresh milk, raw fruit and vegetable salad daily.

As a General Insurance against Inadequacy: Grain should be whole grain. Rice should be unpolished. Lean meat provides concentrated and early assimilable protein, but as a source of building materials and vitamins is inadequate. Pulses are excellent but unpopular in this country. Peas, beans, butterbeans, seeds and whole grain are the cheapest combination of body builders with energy producers.

Fats are good bone formers. During sunless winter months cod-liver oil should be taken for its high content of vitamins A and D and its bone-forming qualities. When distasteful or productive of nausea, a dessertspoonful may be floated on half a wineglassful of fruit juice or ginger wine.

A diet chosen from the above not only supplies the needs of the growing infant, but keeps the mother healthy. In addition, the difficulties and dangers of parturition and the

incidence of fœtal deformity are reduced to a minimum, and an adequate supply of milk for nursing is ensured.

From six to eight months is the normal period of lactation. It is not necessary to forgo fruits and vegetables when suckling. Infants soon adapt themselves to the slightly laxative effect and benefit from the salts and vitamins.

Breast-feeding is the ideal provided that the mother's diet is satisfactory. The child gets all its requirements at a minimum of trouble and risk from infection. When, during pregnancy, however, the mother is inadequately fed, an antagonism develops between her tissues and those of the child. A veritable fight for survival results and the child usually emerges victorious. An emaciated mother and a plump baby are by no means uncommon. In such cases the fœtus actually drains its requirements from the mother's tissues. Denied adequate calcium phosphate in her blood this is absorbed from her teeth and bones. Dental caries is so common in pregnancy that "every baby costs a tooth" has become a proverb. Attention to the diet prevents such misfortunes.

In serious undernourishment bones may soften to an extent producing spontaneous fractures. Such disasters are rare, and except in systematic diseases, such as tuberculosis, need not occur. They illustrate, however, the determination of the offspring to supply its needs.

When carrying, the mother's teeth should be regularly examined. "A stitch in time saves nine." Any sign of decalcification such as caries or erosion (from separation of the "attaching tissue" of the gum) should be met with by increasing supplies of protective and building foods and cod-liver oil. Observations on adults, infants and children have proved that a diet containing a relatively high vitamin D content not only delays the spread of caries but diminishes the incidence of the disease and tends towards cure. In dogs the condition has been produced and cured by withholding and administering vitamins A and D.

Pitfalls:—

(1) Starch and sugars are not building or protective foods but fuel foods. In excess of requirements they tend to increase weight and bulk and so

intensify vitamin inadequacy, especially of vitamins A and D.

(2) Overcooked food is dead: the vitamin content has been destroyed. This also applies to milk. Pasteurized milk, i.e. milk heated to between 145° and 150° F. for 30 minutes, and then cooled to 55° F., is generally considered to be "safe" milk. By this method it is claimed that organisms, including the tubercle bacillus, have been killed without destruction of the vitamin content. There is, however, interference with nature and always a risk that time and temperature may be exceeded. Compared with raw milk the taste is flat.

Fresh milk is the ideal. Tested herds and clean methods are essential. Both are costly. The extra cost is, however, returned in safety combined with full food value. Reduction of price would follow a steadily increasing demand.

(3) The effect of vitamin E on parturition and fœtal development should not be overlooked. White bread does not contain vitamin E. The richest sources are the germ and germinal layers of grain and seeds, green vegetables, the muscle and fat of animals, milk and butter (*see* pp. 24-26).

It is also said to be contained in vegetable oils. Where whole wheaten bread is not available, dried yeast is a cheap and efficacious, though somewhat unpalatable, source of supply. 60% of the vitamin content is said to be passed into the mother's milk.

CHAPTER XIII

THE CHILD: ARTIFICIAL FEEDING

BREAST feeding is the ideal and cows' milk is the best all-round substitute. Goats' milk has been used despite its strong flavour. The goat is a cheap feeder and of a hardy constitution which resists tuberculosis. Consequently goats' milk has been used in the attempt to strengthen tissues liable to succumb to attack by the tubercle bacillus. Arabs use mares' milk, which has a suitable constitution and is digestible.

The cow, in common with all mammals, can only produce in its milk the food factors included in its feed (*see* p. 1). Cows' milk must, in consequence, be carefully chosen and in case of doubt the safest plan is to supplement bottle feeds and so make sure any deficiency is rectified. Cod-liver oil may be regarded as the best all-round insurance. Red meat juice, orange juice, tomato juice, meet obvious needs.

After three months a little yolk of egg supplements any deficiency of vitamins A and D. At six months purées of spinach, carrots and potato can be used.

Sunshine is a valuable aid to the production of vitamin D. Ultra-violet rays may be used in its absence. but cod-liver oil is the cheapest and, perhaps, the best alternative. Food and vitamin A and D are supplied at one and the same time (*see* pp. 15, 54). Cod-liver oil should be fresh. The neck of the bottle, the cork and the medicine glass should be kept scrupulously clean. The dose varies from two or three drops in the baby's bottle, up to half to one teaspoonful later. Excess may cause diarrhœa. Two doses daily, increased if well borne.

Infants and children generally like fish oils and the latter, if uninfluenced, often lick the spoon and proceed to rub it into their cheeks and noses. On the other hand the

youngest are susceptible to the attitude and expressions of their elders and signs of disapproval or disgust result in disability to take it. This inability is psychological but soon becomes permanent, and may be a lifelong handicap, as substitutes are rare. Too often cod-liver oil is presented with some such expression as "Horrid stuff! I could not take it." Praise of its powers should drown all other sentiments.

Yeast and Marmite are sources of vitamin B. When anæmia is present, meat gravy, egg yolk, and spinach supply iron.

The proteins of cows' milk form a harder coagulum than do those in human milk. In consequence cows' milk must be diluted, which reduces its content of sugar, mineral salts and fats. Dilution with whey and the addition of cream adjust the balance.

Proprietary infant foods are usually manufactured from cows' milk or from cereals, the latter to some extent malted. When prepared for use according to directions the majority of these foods are seriously deficient in fats and consequently deficient in fat-soluble vitamins. The antiscorbutic vitamin C is certainly deficient. Unless a definite guarantee is given, mineral salts are probably inadequate. The addition of milk increases the values by the amount of milk added. Scurvy and rickets have resulted from their use. Food mixtures rich in carbo-hydrate and poor in fat produce the plump infant which is too often its mother's pride and boast, but which is flabby and prone to rickets and with a lowered resistance to infective diseases (*see* pp. 52-54, 57-59, 61).

When tinned, bottled and dried foods are used, full information as to their constitution should be obtained beforehand, and a full insurance against inadequacy adopted by the use of fresh foodstuffs, containing adequate protein, minerals and vitamins (*see* p. 68).

CHAPTER XIV

SHOPPING AND COOKING FOR THE FAMILY

WHEN the mother, as family food provider, goes shopping, her object must be to return with a sufficient supply of fuel foods with which to maintain the energies of life, of mineral salts for body building, of protective foods and vitamins to support growth, health and vitality (*see* p. 16); and all this within the means at command. Faced by difficulties of choice she may recall:—

(1) The body's basic needs are met by:—

(1) *Whole wheaten grain* or other whole grain or seeds. Bread, porridge, rice, peas, and beans.
(2) *Milk* and *milk products* (butter, cream, buttermilk, soured milk, cheese, etc.).
(3) *Fresh vegetables*—green leafy vegetables and coloured root vegetables.
(4) *Eggs.*
(5) *Fruits.*
(6) *Liver,* including fish liver and fish liver oil.
(7) *Fish,* especially fat fish (sprats, herrings, mackerel, salmon).
(8) *Meat.*

(1, 2, 3, 4, 5 are essentials; 6, 7, 8 are valuable additions.)

(2) That Nature uses colour as the emblem of quality, and as the symbol of value for money. Therefore, golden-crusted bread, rich yellow milk and cheese, vivid green-leaf vegetables (such as cabbage, savoys, sprouts, spinach, lettuce, cresses, etc.), highly tinted root vegetables (such as carrots, swedes, mangold-wurzel, yellow potatoes), variegated pulses

and seeds (such as green peas, yellow peas, scarlet runner beans and innumerable highly-coloured seeds), fruits (such as oranges, tomatoes, plums and apples with black, red and purple berries), provide better food contents than do their white alternatives.

(3) That protective foods also supply mineral salts and vitamins. That the body's needs for protective foods will be met by the following daily ration (Hutchison & Mottram): One pint of milk ; cheese partaken freely : one orange, one tomato, or a helping of raw salad (one raw carrot, one swede); one ounce of butter or dripping, or fat fish (herrings, sprats or mackerel).

(4) That porridge, bread, potatoes, pea-soup, dumplings, rice and treacle are cheap choices from which to meet the body's fuel needs, and include in the bargain valuable building and protective elements.

Nothing rouses fiercer resentment than new-fangled ideas resulting in changes of diet. Omission of some customary tin or packet is almost certain to call for remark, and may even arouse hostility. When the family is seated round the table, defence, counter-attack, and propaganda may be combined in the following:—

(1) That white bread, factory jam, margarine and tea are definitely a deficiency diet :

(2) That natural whole foods contain Nature's requirements ;

(3) That colour is a mark of food value ;

(4) That quality is to be preferred to quantity ;

(5) That a quality diet, even if sparse, will do more to stay the pangs of hunger than can filling the stomach with pappy dead foods :

(6) That whole grain, milk, cheese, eggs, salads, raw chopped vegetables and fruits will make boys grow tall and strong and give girls beautiful complexions, and will prepare both to enjoy full and happy lives.

The following letter written by a mother who was also a doctor may assist the housewife's ideas and support her confidence:—

"Children's Diet": A Woman Doctor's Experience

To the Editor of the "Morning Post"

Sir,—"An Elementary School Teacher," in her letter to you dated April 19, makes the novel suggestion that those members of the medical profession responsible for the many criticisms on children's dietary should try to see how they would manage on a similar income.

As a member of the profession to whom the gauntlet has been thrown, I accept the challenge and should be glad if you would permit me space to publish my own experiences in feeding my little ones at the time of greatest economic depression, when I was a member of the "unemployed," and my fatherless children were entirely dependent upon my work.

My two little girls, aged four years (twins), each received a pint of milk daily (less a little for my tea morning and afternoon); they had fresh fruit and vegetables, a liberal amount of butter, and about 2 oz. of first-class protein each day for each child.

Here is a brief sketch of our meals:—

Breakfast of Scotch oatmeal porridge and fresh unboiled milk, three-day-old wholemeal bread and butter, half a raw apple.

Dinner: A good soup thickened with lentils, pearl barley, haricot beans, split peas, macaroni, rice or potatoes, with a tablespoonful of freshly-chopped parsley served on the plate. Potatoes cooked in one of the hundred attractive ways, and not sodden in water, formed a "course"; raw fruit to follow. A breakfast cup of raw milk was given at each meal to each child.

Supper at five o'clock consisted of an egg dish, very rarely a little fish, as this food is far too dear for its actual nourishing value; some salad, when not too expensive, or macaroni and cheese, or *home cooked* baked beans and tomato sauce.

I varied the dietary as much as possible with Empire dried fruits made into a simple pudding with suet and wholemeal flour, and we often had suet dumplings in the soup. Apart from the feeling of insecurity about the future, we were very happy and the healthiest people in London, passing through epidemics of whooping-cough and influenza with never even a cold.

Here is a specimen weekly budget:—

	s.	d.
2 pints fresh milk per day at 3d.	3	6
3 stone-ground wholemeal loaves at 4d. ...	1	0
4 lb. cereals or pulses, including oatmeal ...	1	0
4 lb. carrot, turnip, onions and parsnip at 1½d.		6
12 lb. potatoes	1	0
2 lb. Empire apples at 4d.		8
1 lb. Empire dried fruit or prunes .. .		6
½ lb. suet for steamed pudding		3
1 lb. wheaten flour		3
1 lb. Empire (New Zealand) butter		9
1 lb. Empire (New Zealand) cheese		7
1 doz. eggs	1	6
Meat and fish	2	6
	14	0

There were some weeks when certain items were left over; then we had extra salad—tomatoes and, as a rare treat, a tin of pineapple or peaches.

A scrutiny of the dustbins in the garden of the very poor would be a revelation to those who are trying to make political capital out of the "starving children." I fed my own family and myself well on a total average of 14s. a week or less, and they had what I defy anyone to deny—not only an efficiently balanced dietary, but also a most attractive and varied one.

That period of depression is, happily, for me, now past, yet I have kept to the same scheme of dietary, with very few modifications, and we all enjoy the finest health, wear the minimum of clothing, and never have a cold.

(1935.) L.R.C.P., L.R.C.S.

Regular custom is the surest method of combining quality and cheapness.—For this reason each family should estimate means and requirements and make standing orders of the following six items:—

(1) *Whole Wheat Bread,* number of loaves, their shape, size and dates of delivery;

(2) *Whole Wheaten Flour* sufficient for cakes, puddings, soups and dumplings, fish frying, etc.;

(3) *Oatmeal for Porridge, etc.*
(4) *Milk and Skim Milk*—One pint for each growing child and an estimate for family requirements, including milk puddings on certain days.
(5) *Butter and Cheese.*
(6) *Vegetables and Fruits*—Those vegetables which can be eaten raw in salads or scraped in sandwiches are good food value for money and save cooking. One regular dish of this sort is advisable daily.
(7) *Fish* when plentiful.
(8) *Meat and Marrow Bones.*

Notes for Daily Shopping

Nitrogenous foods.—Eggs are best in season when also they are cheapest and should be eaten freely. At a price above "12 for a shilling" they are not good value for money. Herrings, sprats, mackerel, roes of fishes, and joints of meat should be substituted, when plentiful. Despite the "frig.", Saturday still presents bargains to the judicious shopper. Peas and beans are excellent and economical reserves for hard times and occasional dishes.

Fuel foods, especially necessary in winter, are fat of meat, suet, dripping, bone-marrow, butter, fat bacon, fat fish, herrings and mackerel, oatmeal, cod-liver oil.

Energy carbo-hydrates, for work and exercise, are white bread, sugar, root vegetables (potatoes, swedes, parsnips and carrots for their carotene content), unpolished rice, sago, tapioca, macaroni, peas, beans and butter beans are both heat and energy producers and supply some protein and mineral salts.

Mineral salts.—Green leafy vegetables and fruits, cresses and roots for occasional salads.

Materials need workers and an eye must be kept on vitamins and where to find them, and on the family need for them.

The Following Shoppers' List is Appended although the subject matter is dealt with in Previous Chapters

Vitamin A.—For vigour, growth, and resistance to infection; strong nerves and normal productive capacities. Can bear 100° C.

Sources.—Liver oils of fish and mammals, fat fish (herrings, sprats, mackerel), fish roes, marrow bones. Animal fats, such as milk, cream, butter, cheese, suet. Lard, bacon fat and vegetable fats are poor in vitamin A, and this also applies to butters made from vegetable oils, unless animal fats are added, when fortification to the amount and quality of the animal fat used is obtained. Carrots, pumpkin, sweet potato, apricots, peaches, oranges, maize and green vegetables all contain a plant pigment, carotene, from which the body can manufacture vitamin A.

Vitamin B Content.—Vigour of brain, nerves, muscles and heart, keen appetite for plain food—stature, clear skins, regular bowel functions, fairly heat stable.

Sources.—Yeast, all whole grains and seeds, egg-yolk, liver, meat, vegetables, and fruits.

Vitamin C.—Pure blood. Healthy tissues, sound clean teeth, strong bones. Anti-scorbutic. Easily killed. Anti-rheumatic.

Sources.—Fresh green vegetables, root vegetables, fruits, pulses, fresh milk, meat and fish. Cooking is destructive. For full vitamin value: Salads and sandwiches made of tomatoes, cresses, lettuce, scraped carrots, potatoes, chopped cabbage, with egg or raw meat.

Vitamin D.—Bone forming, especially necessary in winter and for women and children. Not very stable to heat.

Sources.—Sunshine and cod-liver oil dependable sources. Fat fish, fish roes, eggs, butter, and milk.

Vitamin E.—Reproductive or fecund. Stable.

Sources.—Wheat-germ oil and full grains and pulses. Eggs, milk, meat, lettuce, spinach, watercress, coconut oil, cotton seed.

NOTES FOR THE KITCHEN

Raw foods contain full vitamin and food values.

Heat must be regarded as destructive and to be applied for the shortest time possible in which to obtain the required results. (Experiments pp. 43-44, §§ 1-4.)

When over-cooking is undertaken deliberately, as is done in stews to make tough meat tender, vegetables should be

added at the last moment and a salad or fruits should be supplied to the day's "bill-of-fare."

Cooking

The most commonly-used methods are the best:—

Frying is the most economical and least destructive way of cooking fish and potatoes. Fat fish such as sprats will cook in their own fat. Little waste results in this method. Frying in fat adds the fuel value of the fat used. Bread and potatoes most commonly treated in this way.

Boiling for green vegetables, potatoes, etc.—For greens not too much water. When boiling add the vegetables and cook for 20 minutes with lid on. The shaking of the saucepan handle denotes that boiling is taking place and the lid should not be removed for inspection.

Steaming, little waste of food cooked.

Roasting is wasteful of heat and bulk of joint.

Casserole Cooking is satisfactory but slow. Retains mineral salts but destroys vitamins in proportion to heat and time.

CHAPTER XV

COOKING AND DIETING IN THE PAST

COOKING is the application of heat to food. The *objects* to be obtained are:—

(1) To improve its appearance;
(2) To improve its taste;
(3) To prevent decomposition and enable it to keep longer;
(4) To kill animal parasites and the germs of specific disease;
(5) To render it more digestible:
(6) To accomplish the above without undue wastage and without killing the vitamin content.

A temperature of not more that 170° F. is probably the best at which to aim.

Cooking dates from early times. Doubtless prehistoric man found meats more palatable when roasted in his wood fire. Passing through the fire may also have had a religious or ceremonial significance. The following method of cooking meat is still used by certain savage tribes, has in emergency been found satisfactory by explorers and travellers, and probably dates from primitive times: A hole is dug in the ground, wood is thrown into it and a fire then lighted and kept burning until a mass of red embers is produced. Small stones are then thrown on these red embers and the joint to be cooked is placed on them and covered with aromatic leaves. The earth is immediately thrown back into the hole and stamped down hard. The process is slow, and may take even 24 or more hours, but after lapse of that time, the joint is not only steaming hot, but the toughest meat has become succulent and tasty.

The relation existing between diet and health has been recognized in this country for many years.

Sir John Harrington's version of the celebrated "Regimen Sanitatis Salernitatum," written about A.D. 1100,

and translated by him some five hundred years later, is interesting because during several centuries it was used as a text book for medical instruction.

One of the verses reads as follows:—

"Good diet is a perfect way of curing,
And worthy much regard, and health assuring:
A king that cannot rule him by his diet
Will hardly rule his realms in peace and quiet."

In the fourteenth to fifteenth centuries dieting received considerable attention. At that time physicians and artists were closely associated in their mutual study of anatomy, and both these were in frequent contact with apothecaries because the latter furnished drugs to the physicians and paints to the artists.

In addition to his paintings, Leonardo da Vinci, 1452-1519, educated in Florence under the Medici, dissected more than 100 bodies and left unsurpassed anatomical drawings, and notes for a book on nutrition named by him *How the body of animals continually dies and is reborn.* Amongst these notes the following statements appear:—

"The body of everything that takes nourishment constantly dies and is born again, because nourishment can only enter into places where past nourishment has expired."

"Expired nourishment is dead."

"If the supply of fresh nourishment is not equal to the expired nourishment life fails in vigour, and with no nourishment becomes utterly destroyed.

"If as much nourishment as is consumed day by day is restored, just so much life is reborn as is consumed, as a candle flame is fed by the liquor, which, continually with rapid succour restores from below what is consumed in dying; which death is continuous as the smoke is continuous.

"The continuance of the smoke equals the continued nourishment.

"The flame is dead or regenerated with the movement of its nourishment.

"As the flicker of the flame seems to show, nourishment gives life its ebb and flow."

Appreciation of the function of oxygen in burning fuel foods is suggested by the statement that "where flame cannot live, no animal can sustain its existence."

The conclusion of these observations is startling: "Man is merely a channel for food, a tomb of other animals, a haven for the dead, a coffer for corruption."

Pope, in his *Imitation of Horace,* reached somewhat similar conclusions on the subject of ill-feeding:—

"A tomb of boiled and roast, of flesh and fish,
Where bile and wind, and phlegm and acid jar
And all the man is one intestine war."

CHAPTER XVI

WASTED FOODS AND THE COST

ASHBINS demonstrate that the people of this country have become wasteful by habit. "Bread is the staff of life" and "Waste not want not" are no longer revered maxims. Food materials used by our forebears and odds and ends made by them into succulent dishes are to-day wantonly thrown away. The heading to this chapter, however, alludes not to personal but to national waste—to waste on a scale sufficient to endanger the life of a race, to wasted food values, wasted energy and health values, and to expenditure wasted on services necessary to deficiency, but unneeded by the efficiently fed.

The fundamental causes of waste are ignorance, prejudice and subnormal mentality. Our present system of education has increased the prestige of the typewriter at the expense of the cooking pot, and guided ambitions towards gentility rather than robust health. As a result, pride in housewifery has diminished, and the young wife faced by a problem which she does not understand and for which she is untrained in mind and body, becomes resentful and slap-dash. The result is waste of food and health on a national scale.

Prejudice, in the past, resulted in rigid adherence to precedent. Nevertheless waste was abhorred, and Nature does not change. To-day, desire for social advancement regards white bread as a sign of progress, while soup carries the stigma of the soup kitchen. Subnormal mentality is inherently wasteful, and therefore self-destructive unless conserved by protective support. Nature's prehistoric battle of wits, with survival of improving types, has ceased, consequently subnormal mentalities are on the increase and wasteful habits and ideas grow with their growth.

Ignorance and prejudice should be countered by a wide distribution of the known facts. Where science has proofs these should be broadcast. Waste should be condemned

as anti-social and bad form. Facts such as mice fed on a balanced diet of prepared proteins, fats, carbohydrates and mineral salts became diseased and died, but lived and flourished when fresh milk was added, yet died when this addition of milk was boiled (*see* p. 43 §1) should be known by the whole community. To spend hard-earned wages on dead foods is waste. To buy living foods and kill their sun-life content is waste. Waste of labour, waste of the heat units used in cooking, and waste of health. Advertisement of dead foods is a double waste. Value is spent to increase deficiency.

All tinned and proprietary foods should be labelled with a guarantee to which manufacturers could be held.

Bread.—Grain foods are an essential part of man's diet. In the British Isles, and especially in its densely populated towns, white bread and white flour, produced by rejection of the germ and germinal layers of the wheat grain, are in almost universal use. Costly and essential germ oils, proteins, mineral salts and vitamin B are discarded for a cheap and inert energy food *Starch*. In China (*see* p. viii, 45-46) a similar rejection of the germ and germinal layers of the rice grain produced a deficiency disease called beri-beri which resulted in ill-health and death to untold millions, and has reduced the stature and capacities of the race.

Recent discoveries have proved that these proteins, germ oil, mineral salts and vitamin B, increase stature and vitality, fortify the brain and nervous system, maintain fertility with easy delivery of healthy offspring, and reduce infantile and maternal mortality. These findings have been confirmed by Sir Robert McCarrison's experiments on rats (*see* pp. 42-43).

White bread is the staple grain food of the British people. White bread and white rice have produced comparable situations, although the Englishman's higher standard of living has modified a profound and major deficiency into a widespread but minor deficiency. (*See* Pigeons fed on white rice, pp. 43 §1, 46.)

The cost in sterling under the several headings of wasted food values, wasted health values, and wasted energy and work values, is enormous, and this cost must be more than doubled by the costs of replacing food thus lost, and of services to ill-health thus produced.

Green vegetables are protective foods: Sun life and soil life are bottled within them. These vital products are easily killed by transport, heat, cold, acids and alkalis. Cooking is destructive in its effects. The food values lost in cooking are difficult to determine and vary with the process and the substance cooked.

The Medical Research Council's report on "Changes brought about by Cooking" (1936) will repay study. In this report vegetables boiled in water for 15 minutes and for 30 minutes gave losses of salts into the water estimated for calcium, phosphorus and iron at 3 per cent., and the deduction is drawn that losses due to throwing away the water in which vegetables have been boiled is negligible. McCarrison states that more than 50 per cent. of water-soluble vitamin B is lost.

Interesting and vital questions are involved in the M.R.C.'s statement.

The populations of many countries regard vegetable soups as containing high food values and hardy peasantries make bread and soup the basis of their dietary. Moreover, soups made by boiling vegetables would naturally be expected to contain essential potencies as do tea and coffee and the infusion of the British Pharmacopœia, similarly made from vegetables, plants, etc. In addition the 3 per cent. regarded as negligible may be vital. Banks, finance houses and insurance companies conduct vast operations daily on a smaller margin and the old and retired perforce live on it. Circulating in the blood and feeding the brain and other body tissues 3 per cent. may represent the balance between deficiency and competence, between success and failure.

Fish, when they do not live on one another, live on minute vegetable life found in the sea. The sun has stored chemical foods and vitamins of immense value in these tiny sea vegetables and plants, and fish eat them and build them into their tissues. Protein, fat, minerals such as calcium, phosphorus, iodine, chlorine, sodium, potassium, in fact the chief needs of growth and activity are thus found in fish. The bones, the skin and organs such as roes and liver are vast storehouses (*see* pp. xii, 15, 30). The bones and heads, tails, skin and many parts of fish full of vital foods are daily

thrown away. Something may be saved when they are used as manure for the production of new vegetable life, but experiment and experience have proved that life is not easily tinned or bottled, and nerve foods made from them and stored in this way must be regarded with caution.

Fish soups made from these rejected parts are tasty and of good food value and are much favoured by the gourmets of foreign races.

Skimmed Milk.—Milk is to-day largely separated by machinery. Whether this is wise when a million and a half unemployed are asking for work is doubtful, but one fact is not in doubt, and that is that life is jeopardized by mechanical processes, and that butter made in this way has neither the taste nor the vitality of hand-made farm butter, such as was produced years ago by hand skimming and hand churning. Skimmed milk, the fluid residue of gravity or mechanical separation still contains a small amount of fat and the soluble proteins, milk, sugar, mineral salts and some vitamins. It is a cheap source of these valuable sun-life products. In the past sturdy peasant populations have been brought up on the produce of a cottage garden, which also supported a pig and some fowls, and to which the farmer added corn and supplies of skimmed milk.

Despite adverse conditions energy and high spirits were characteristic of the countryside. The grandparents and great grandparents of present-day town dwellers lie in village graveyards scattered throughout this country and bones and teeth display the efficacy of their diets.

National waste is a two-edged sword and would well repay serious consideration.

Three points may be borne in mind by those desiring further study of the Medical Research Council's Report on Cooking, 1936:

In the FIRST place the small extent of the ground covered by the experiments in relation to the vastness of what might at first appear to be a small subject.

Thus, there are 20 mineral elements, all necessary to bodily health but not all included in the experiments. Solubility is the essence of transfusion, and potatoes,

carrots, peas, scarlet runners and spinach are usually mashed and eaten as thick soups; cabbages, turnips, onions, tomatoes, celery, pea-pods and herbs being commonly selected for the purpose of making vegetable soups.

Amongst this latter soup-stock class the range of loss is high—chopped savoy cabbage lost 20 to 45 per cent. when boiled for 15 minutes and more if boiling continued for 30 minutes; chopped onions 30 to 80 per cent. when boiled for 45 minutes.

Potassium, a most essential blood salt, gave the high actual loss of 727 mg. compared with the daily intake of 3,400 mg., i.e. more than 20 per cent.

Iodine, a prime essential to tissue change, does not appear to have been considered: nor have vitamins, though steadily increasing in number and importance.

SECONDLY.—The 3 per cent. loss is apparently limited to calcium, phosphorus and iron, the first and last of which are not remarkable for their solubility, and it appears, from the tables given, that if the more soluble minerals are taken by selecting those vegetables which contain them, a much higher percentage would have resulted.

If, however, 3 per cent. is accepted there are in addition vitamins, essences, flavours and sun-life elements to be considered, which are either not yet discovered, or the functions of which are not thoroughly understood.

THIRDLY.—The 3 per cent. regarded as negligible may be vital (*see* p. 80).

CHAPTER XVII

THE CHOICE

A NATION which at the challenge of War declared itself to be C3, and which is annually advertised by its Ministers of Health to have upwards of 95 per cent. of its population suffering from "oral sepsis," a euphemism for the statement that germs from decayed teeth are propagating in almost every mouth: which has been forced to lower its standard for army recruitment more than once, and which finds itself dependent on foreign sources for three-fourths of its food; would appear to have no choice other than to start, without delay, to discover the causes of these deficiencies and forthwith inaugurate a national effort to rectify them.

Despite that no leader has appeared and no challenging pronouncement has been made on this subject, the masses of the people are anxious and privately acknowledge their ignorance. Sporadic and abortive attempts are made but towards no decisive objective. The fact that germs cause disease has been grasped. Therefore, bread shall be delivered each loaf wrapped in a paper bag as a protection against dust and the baker's fingers. Sound and scientific reasons can be adduced in support of this procedure. Moreover, the proverbial "peck" will require longer to fill with dust and those whose ideal is length of years and not productive activity wax enthusiastic.

Practical common sense, however, suggests that the costs and labour will be wasted when the first bite into this carefully delivered bread will be made by carious teeth often rotting with decay, and which each movement of mastication will impregnate it with saliva teeming with a multitude of virulent and rapidly propagating organisms. Few have grasped that the processes of the body are as mechanical as the building of a house (*see* pp. 7, 9-10) or the running of a petrol engine, and that bodily structure and the body's output of energy depend on the qualities

and the constitution of the food intake as surely as the building depends on the materials supplied and the efficiency of the working staff, or as inevitably as the life, sweet running and output of the engine depends on the use of first-class building materials and on the quality of the petrol put into the tank.

Large sums are spent annually on dental clinics, and on brushes, powders and washes for the teeth. Governments announce every increased grant with pride. Yet savages, primitive peoples and peasants living on diets so sparse as to be stigmatized as "starvation diets" have good teeth and are saved this expenditure. Despite anti- and post-natal clinics and maternity benefit, the mortality of child-birth, infantile and maternal, even in the most up-to-date hospitals, is unsatisfactory. We have seen that rats on a Sikh diet enjoyed robust health and bred freely without loss of mother or young, while rats fed on an English diet were poorly developed and suffered difficulties in labour and loss to parent and offspring.

No expenditure, no effort, no sacrifice, can be too great to relieve suffering, but prevention is better than cure. Natural laws are set for the elimination of the unfit, the foolish and the unthinking.

If milk, whole grain, vegetables and fruit provide materials and workers, proteins, fats, mineral salts and vitamins, which will erect in every young mouth a complete set of sound teeth and will likewise provide the mother and her unborn offspring with health and a safe and easy passage through childbirth, then these should be provided at all costs.

If, again, a young savage provided by nature with sound teeth suffers dental decay with its sequelæ, oral sepsis and bodily infection, when fed on the Englishman's diet, then the fact should be proved, the causes laid bare and the cure advertised. Scientific investigation, experiment and experience can settle most of these points in a short time. European nations are already conserving their resources and improving the health of the rising generation by acting on them.

History relates that heavy taxation injudiciously spent has resulted in the decline and fall of empires. Expenditure on preventable disease is a load fixed on the shoulders of youth and which may prove fatal in emergency.

The Foods of Nature provide health, vitality, courage and stamina. They are toothsome and appetizing. They fortify the tissues to resist germ-produced disease. They cleanse the tissues and prevent the fatigue, the aches, pains and crippling effects, of deficient elimination. The Foods of Nature are cheap or can be rendered cheaper by sustained demand.

Is Prevention better than Cure? That is the choice.

CHAPTER XVIII

HAVE BRITONS GONE SOFT?

THIS question crops up annually during the silly season. The answer is NO, and the proof of that answer is not any reference to the deeds of the past or to qualities displayed in the Great War where varied financial support affected the personal issue. It is this: Ask any foreigner conversant with the language, outlook, customs and qualities of the British race to chose from amongst the nations one to stand by him in emergency, to support him through long and difficult effort, to direct him with level-headed advice, to rule him as a master or to serve him as a dependant, and the issue is not in doubt. Nevertheless, sixty years ago the question would not have been asked and the fact that it is asked, and asked with increasing frequency, shows that it raises an echo in the hearts of the majority.

To-day the world is in a state of crisis and British supremacy has been challenged, and challenged with some success, in the fields of sport and in every department of business, commerce and endeavour. Health statistics, a suppressed national irritability shown in family and business relationships, and a certain lack of stamina, suggest a streak of deficiency. The whole nation is anxious as to the cause and determined to rectify it in the interest of their offspring and descendants.

Experiment and experience have shown that despite a comparatively high standard of living the national dietary is unsatisfactory. The fact is recognized that our food intake is not the result of a definite choice made deliberately after scientific investigation for the purpose of producing the maximum of vigorous health, but is the result of trade policies and a general acceptance of the easiest route through a period of extraordinary change, when attention was fixed on immediate issues and before present data were available (pp. xiii, 3). No doubt exists in a single mind that we have the power and the means.

The question is—"WHAT SHALL BE DONE?"

CHAPTER XIX

THE OBJECTIVE AND HOW TO REACH IT

THE OBJECTIVE is a return to the simple, unaltered foods of Nature. The slogan should be: Nature's foods are best because down the ages man has developed by adjusting his nature to Nature's foods. This adaptation is progressive and does not exclude change. Without change progress is impossible and to-day Science and experience widen the field of vision.

One fact must, however, be borne in mind. In the past mistakes meant disease and death, and constant elimination of weakness kept the race not only on the right track, but healthy. To-day life is less strenuous, and the payment demanded less drastic. In consequence large hidden deficiencies may accumulate and pass unrecognised.

Obviously this objective includes production of sufficient supplies of Nature's foods to meet the needs of all, and at a price not beyond their means after transportation. Every child should be given a chance. Men undertaking fatherhood should realize and accept their responsibilities, and mothers should understand the needs of their offspring both pre-natal and post-natal.

Middle age must make its choice but it should be discouraged from attempts which damaged teeth and debilitated digestions would find impossible.

Enthusiasts and faddists should be discouraged. Plain statements of all facts by unimpeachable authorities should be the rule. A scientific, commonsense, regulated and determined effort should be made.

How is the objective to be reached ? Many panaceas are offered. If, as stated (p. 78), the main causes of malnutrition are ignorance, prejudice, incompetence and poverty, and if, as described (pp. 56-57), deficiency diseases due to ill-feeding are sapping the national vigour, and there is a general agreement on these points, steps should be taken at once.

The following suggestions are made: Ignorance should be dispelled by distribution of the wealth of available knowledge on food. The functions, values, and best methods of preparation of food, simply and clearly stated, should be broadcast in the Press and on the Wireless, and should be taught in all schools. Practical demonstrations should be inaugurated in every district throughout the country. Poverty so extreme as to be actually in need of food should be granted supplies to meet the emergency, and great advantages would accrue if these supplies were in kind. A correct diet would then act as a restorative and an education. Such action should, however, be as far as possible limited and temporary. Meanwhile, the causes of poverty should be investigated. The enormous fund of experience buried in the minds and case books of family doctors should be unearthed and unravelled. Similarly, the experience of clergy, social workers, police court officials, and gaol warders, should be tabulated. Trades Unions might be willing to assist. The over-generous and selfless would be found there, and it would be interesting to discover how far "the waters return broadcast gifts," and how long the "widow's cruse" can continue its miraculous supplies. It would also be interesting to discover to what extent incompetence, laziness of body and mind, subnormal mentality and anti-social tendencies are responsible.

Whatever treatment is adopted must vary to meet all conditions. No hard and fast scheme could suffice and it is difficult to imagine governmental control through some bureaucratic department as ideal. State control tends to rigidity, hard cases and immobility. It is costly and wasteful in method, and is definitely at a disadvantage in dealing with the fluidity of life. Bureaucracy, entrenched in safety, is in a position to take risks, and demand payment of its victims. Its knowledge of the "ups and downs," and of the emergencies of life, is theoretical. Individually, its agents are cultured and sympathetic, but they have not been through the mill.

After broadcasting and distributing information about food, increased supplies to meet newly directed requirements must be made available, and at a reduced price. Though difficult, this is not impossible. On a food value basis, substitution of full wheaten bread for white bread

would materially reduce the family bread bill. Milk should be used for human consumption only, and any excess made into butter and cheese. Skimmed milk should be popularized as a drink for growing children, and for use in puddings and soups. Large-scale growth of vegetables on farms situated near and around towns and cities should be encouraged. Schemes for washing and preparing vegetables for use as salads, and for soups and cooking, should be inaugurated. Co-operation between producer and consumer should be organized to prevent waste of seasonal foods, such as fruit, eggs, catches of herrings and sprats, etc.

Happily, this is a grass-growing country, with a fertile soil and copious rainfall. Grain, milk, butter, cheese, vegetables and fruits are its natural products. The possibilities of production for milk and vegetables are enormous. Unhappily, we have become a race of town dwellers, with little understanding of the risks undertaken or the hardships endured by those who struggle with the vagaries of nature. Education on agriculture and methods of food production should be broadcast, and taught in schools, with the instruction on food values already advocated. Harvests cannot be gathered by the sparse agricultural population now left on the land. High costs and much waste have resulted from shortage of labour. Instead of hiking, young city dwellers might volunteer for harvesting, haymaking and the gathering of fruit and vegetables. Grim, hard work would be necessary, but health and sinews would benefit, and respect for the farmer and his men would increase. The British farmer undertakes a risky job when he labours to dig his capital into the soil. Returns are uncertain. Filling endless forms after a long day's labour is impossible. Time for study is inadequate and irregular. Practical knowledge should be placed at his disposal, and during the above changes loans at low interest, or partial subsidies towards working costs, might be considered.

The alternative to cheap food is State feeding. Free meals are already provided and the expenditure gives a good return in growth, health and vitality. But man is not only bone, tissue and flesh, but has a spirit which animates and governs his body—and this spirit can burn

up his tissues as a flame eats fat, and has power to make him an engine of destruction to himself and others.

"By the sweat of his brow shall man eat bread" or suffer from a thwarted, warped and dissatisfied mind.

But surely children do not suffer in this way?

Happily, no. The food has an immediate and beneficial effect. Yet effects produce after-effects. The child is father to the man. Parents may give: their loving sacrifice has a stimulating and refining effect on the character of their offspring, but State aid too often acts otherwise. On arriving at manhood the recipient tends to develop a feeling of inferiority or, in the jargon of the day, an inferiority complex results. Alternating exaltations and depressions, the vain boastings of secret shame, grandiose schemes and feeble accomplishment lead to subterfuge. Attempts are made to camouflage inefficiency by accusations against the environment, throwing responsibility on others; ultimately, and only too often, hatred warps a spirit which in the end sinks to crime.

Wise old physicians are sometimes taunted by younger colleagues for adopting an expectant attitude when Nature fights her battles. Long experience has taught the dangers of interference with natural processes. Care, wisdom, scientific data and goodwill are needed for the elucidation of such difficult problems. Good food for the body is essential but the spirit must not be thwarted or sapped.

The ideal to be aimed at is the free and balanced mind, in the well-knit, healthy and vital body. There is considerable evidence that down the ages both the body and mind of man have been enabled to rise superior to the vicissitudes of his environment. Given the knowledge, the choice is for the people, as theirs will be the payment for mistakes. All the facts of science and of experience should be placed in their hands, and these facts can be simply stated in such a way as to be understood by all. It has been said that the people are always right, and when Britons come to a decision on accurate data, this statement is probably correct.

CHAPTER XX

ACROSS NO MAN'S LAND

CHANGE necessitates disturbance and personal inconvenience. Change in national diet would be a slow transition. Public opinion would have to be re-educated. Infants, children and young people would be chiefly involved. The mass of the people would proceed on its way, only here and there modifying fixed habits as success roused interest and enthusiasm. No upheaval to established trades and individual enterprises need be anticipated.

A steady and growing demand for nature foods by an interested and instructed public would produce some of the following results:—

(1) An increased, and steadily increasing, consumption of milk.

(2) A fall in milk prices as mounting consumption diminished overhead charges.

(3) Increased support for an A1 standard, not only of purity, but of living-food-content in the national milk supply, and for improved methods of delivery in sparsely populated districts.

(4) Press assistance to milk producers during a period of rapid change, by means of a campaign instructing the public that uncertainty of demand means wastage and high costs, and that a contract order for a definite quantity daily enables producers to estimate requirements.

(5) Diminished consumption of factory-made milk products in the home markets, except for travellers and for special purposes.

(6) New requirements to fill the vacancies thus created and which present factories could undertake, such as the daily production and distribution of cheeses, cream cheeses, curds, hand-made dairy butter, buttermilk, skimmed milk, sour milk, and sour milk whole-wheat scones or soda bread (a most delightful and health giving breakfast dish when taken with real butter), junkets, furmity and a host of

other milk products now considered old-fashioned, but which, besides being tasty and appetizing, gave health and vigour to the countryside sixty years ago.

(7) Reappearance of the whole-wheat bread and of the golden-crusted, "sweet-as-a-nut" farmhouse loaf of our Georgian great-grandfathers.

(8) Revival of local milling industries and remodelling and rebuilding of barns for grain storage, owing to the fact that as the germ layers of grain are liable to decomposition their retention in the whole-wheat loaf would necessitate grinding and delivery of flour at short regular intervals.

(9) Increased demand for home-grown wheat.

(10) More general use of, and demand for, clean fresh vegetables, and to provide this, growth of satellite vegetable farms round towns and cities and of new industries organized to wash, clean and otherwise prepare vegetables before delivery, in order to reduce the labour of the housewife to a minimum.

(11) A new demand for "lightning" transport as the knowledge grew that green leafy vegetables commence to suffer loss of vitamin activity from the moment they are cut, and that this loss is serious after the lapse of two or three days, and that when withered such vegetables are practically useless.

(12) Transference of money and leisure thus freed for use in physical training, exercises and sports. Improved health, steadier nerves, and less kitchen work, ease to the mother and happier homes, would be certain. The rising generation would be taller and straighter both physically and morally, and would receive new courage and vigour to step out and grapple with their destinies.

(13) Frequent milling of fresh flour and increased demand for home products would revive agriculture, refill villages with prosperous workers, and fortify our world position as a nation.

(14) Grocers, provision merchants and other traders now snowed under by innumerable brands of comestibles, few of which they can guarantee with knowledge, would be eased.

(15) Market-gardeners would combine with greengrocers not only to serve an increased demand for every form of vegetable, but to meet the request to deliver it ready for the pot and even cooked.

(16) Routine deliveries of bread, milk, sour milk scones or soda bread cakes, fresh butter, curds, sour milk, cream cheese and other cheeses, junket, skim milk and fresh milk products; of vegetables washed, cut and sorted ready for the pot; of vegetable stocks (guaranteed full food content); and of home-made cakes (also guaranteed of pure food quality), to meet a fixed and steady demand, by dairymen, grocers and greengrocers, or by some new delivery service arranged by them in combination.

(17) A simpler national diet and fewer meals owing to the adoption of living foods with their wonderful staying power. Less time spent in eating and preparation of food and less time spent in washing up crockery and cleaning pots and pans. Routine deliveries of a backbone of regular dishes (*see* §16 above) would save an immense amount of kitchen labour. Routine meals are popular with men and children, both of whom like to know what is coming.

Nature foods bring keen appetites. Their staying power is enormous, because from them the blood fulfils its requirements. Depleted and dead foods fill the stomach and starve the blood. Hunger is the call of starved blood coursing through the brain. When the brain sends out this cry of need, too often drugs and stimulants, tea, coffee and alcohol are the response (*see* p. 21).

Nature's foods satisfy the blood. After them, even when hunger returns and the stomach is empty, there is no sinking, no headache, no sick feelings of fatigue, because the tissues can carry on with stored reserves. Nothing more than a pleasant desire, always ready but never desperate, results. The rewards of a National return to a *living diet* would be: Tasty foods, hearty meals, less kitchen work, happier home lives, a revived countryside and resuscitated agricultural industries and pursuits. The present drift towards town life would be stemmed. The mother would have time and leisure to enjoy her children and her home.

CHAPTER XXI

MOBILIZATION OF PUBLIC OPINION

SUGGESTIONS:—

(1) The Wireless might be used for a series of talks such as the following:—

(*a*) What food is.
(*b*) What food does.
(*c*) How food does it.
(*d*) Why Nature's foods are the best.
(*e*) The dangers of living on partial foods, on fabricated foods, and on devitalized foods, with reasons.
(*f*) The benefits to be derived from adopting a diet of whole natural foods.
(*g*) The cost and difficulties of the change.
(*h*) How to cook with a minimum loss of food values.
(*i*) Fresh uncooked foods, their uses and how to prepare them.
(*j*) Ideal diets for spring, summer, autumn and winter.
(*k*) Diets for special trades and occupations.

Obviously this list could be extended indefinitely, but at this stage debates might continue the instruction and give objectors a chance to air their grievances.

(2) Children should be given lectures and demonstrations during school hours. It is suggested that special lecturers and not school teachers should do this. The school doctor might be willing. Knowledge sufficiently wide to make the subject interesting should be the one desideratum. Repetition over the four or five years of school life would result in a definite basis of theoretical and practical knowledge. Senior scholars who were keen enough might assist in demonstrations.

LECTURES.—Practical simplicity would be met by the following, which should be interesting:—

(1) How the sun produces vegetable and plant life.
(2) How the life produced by the sun in vegetables and plants becomes the builder and supporter of life of man.

(3) Milk as the skeleton form of the complete diet. Proteins, fats, carbo-hydrates, mineral salts and vitamins.
(4) Classes of foodstuffs, what they do and where they are found.
(5) Vitamins, what they are and what they do.
(6) Food for the baby; food for children; food for elder sisters and brothers; food for father and mother; food for grandfather and grandmother.

These *Six Lectures* should be followed or alternated with *Six Demonstrations.* The difficulty of providing room, apparatus and material must be surmounted.

DEMONSTRATIONS:—

(1) *Breadmaking*: Corn. Grinding the corn into wholegrain flour (this can be done in quite a small mill costing 10s. A decent-sized coffee mill suffices).
How to make dough. Yeast and its properties. Methods of baking.
Porridge. Furmity. Griddled bread. Sour milk and soda cakes.
(2) *The Cooking of Vegetables; How to prepare Soups*: Vegetable soups. Fish soup. "Odds and Ends" soup.
(3) *Puddings*: Milk pudding, junkets, bread pudding. Suet puddings. Pastry and pies.
(4) *Salads*: Raw vegetable dishes and fruit salads. Winter and summer salad dressings. Pulses and how they are grown, and are served. For the uses of pulses in national emergencies and food scarcity (*see* p. 38).
(5) *Cooking of Meat and Fish.*
(6) *Emergency Dishes.*

As this curriculum went the rounds, ideas would sink in. A new attitude towards the subject would develop. Children, quick to learn and take up novelties, would instruct parents. Such knowledge would be of inestimable benefit to the unemployed. The facts are so simple that neither hardship nor difficulty should be encountered in their acquisition. After due instruction and notice given, a simple law might be passed that young men and women before marriage should present a certificate of knowledge on how to feed themselves and their offspring.

CHAPTER XXII

FOOD AND THE RACE

CLIMATE and soil are the chief factors in the production of race characteristics. Climate and soil produce food.

Food builds the bones and regulates the stature.

Food forms the muscles and sustains their activities.

Food builds the brain, the heart, the nerves and all the great bodily organs and is not only ever at work to replace damage and waste, and to repair deficiencies, but also supplies the guides and rulers necessary to co-ordinate and direct all their activities down to the minutest detail.

Food gives colour to the cheeks and supplies the pigment for skin, eyes and hair.

Sterility or fecundity depend on food. Easy or difficult labour depends on food. Infant and maternal mortality depend on food. Brain power, body power, courage, stamina, the joy of life and the depression and suffering of disease depend on food.

Inherited racial characteristics are helpless to reproduce their potencies without suitable foodstuffs on which selective calls may operate their choice. Want of sunshine, damp, cold, and hardships can be supported into perfect health by balancing these deficiencies with special foodstuffs.

Food is the sustenance of life and supports all its activities.

Food and only food can give the figure beauty of form, as it can cripple into deformity.

More vital to its health, its capacities, and its continuity than are the hospitals, social services, education or policies is—

THE FOOD OF THE RACE

THE END

A FEW OLD RECIPES

METHODS OF MAKING WHEAT BREAD

NOTE.—The wheat can be ground in a fair-sized Coffee mill if reliable whole-ground flour is not available.

WHEAT BREAD.—I.

Clean hands, 3½ lb. wheat, 1 oz. salt, 1 oz. yeast.

Put wheat and salt in basin, make a dip in the centre and put in the yeast and a breakfast cup of *warm* water, cover with a clean cloth and stand on top of stove (or in a *warm* place) at least two hours. Add warm water and mix all gradually together then knead it *thoroughly*, make into one large "round", put back on stove, cover with cloth and leave one hour, *knead again* and cut into six loaves. Have a greased "oven shelf" (or bread tin), put in your loaves and leave on top of stove for about 15 minutes (or while the oven heats up) with "regulo" G.

Bake on middle shelf about 40 minutes.

WHEAT BREAD.—II.

Take about twopennyworth of yeast and crumble down in a small basin, sprinkle a little sugar over it and a little tepid water and leave it to rise in a warm place for about half an hour.

Get your flour and a little salt and let this run through your hands, mixing well all the time; when the yeast is ready add it and mix *well* with tepid water till you have a good firm dough, again leave this to rise for about an hour or till it rises to the *top* of the bowl. Now cut the dough and make it into four loaves and leave it to rise again. Bake for 45 or 60 minutes. If hard at the bottom the bread is done.

HOME-MADE BREAD.—(London, July, 1861, appeared in print.)

To one quartern of flour (three pounds and a half), add a dessert-spoonful of salt, and mix them well; mix about two table-spoonsful of good fresh yeast with half a pint of water a little warm, but not hot; make a hole with your hand in the middle of the flour, but not quite touching the bottom of the pan; pour the water and the yeast into this hole, and stir it with a spoon till you have made a thin batter; sprinkle this over with flour, cover the pan over with a dry cloth, and let it stand in a warm room for an hour; not near the fire, except in cold weather, and then not too close; then add a pint of water a little warm, and knead the

whole well together, till the dough comes clean through the hand; some flour will require a little more water—but in this experience must be your guide; let it stand again for about a quarter of an hour, and then bake at pleasure.

GRIDDLED BREAD OR IRISH FUDGE.

1½ lb. wheat, 2 teaspoons sugar, ½ teaspoon salt, ½ teaspoon cream of tartar, 1 teaspoon bicarbonate of soda.

Mix ingredients all together except the soda—dissolve soda in one and a half breakfastcupfuls of *butter* milk (or, failing that, warm sour milk); add this while *bubbling* to the dry ingredients and make *quickly* into rolls or scones. Bake for 20 minutes in a *good oven.*

NOTE.—Fresh milk, unless chemicals have been added, will sour if slightly warmed and kept in a warm place. Once sour milk has been produced, a teaspoonful or more added to the day's fresh milk, or that amount of it required for breadmaking, say one pint, will accelerate the process of souring and make it available when required. Soured milk should only be allowed to become mildly acid and should be thrown away if a bitter taste develops.

OAT CAKE.

1 pint medium oatmeal, 1 oz. butter, ¼ pint hot water—salt.

Melt butter in warm water, mix in the oatmeal and salt. Roll out *very* thin, cut into shapes and bake on oven sheet in a *cool* oven—they must *not* brown.

FURMITY.—I.

To a quart of ready-boiled wheat, put *by degrees** two quarts of new milk, breaking the jelly, and then four ounces of currants picked clean and washed, stir them and boil till they are done. Beat the yolks of three eggs and a little nutmeg with two or three spoonsfuls of milk: add this to the wheat: stir them together while over the fire then sweeten and serve cold in a deep dish. Some persons like it best warm.

NOTE.—New wheat should be used.

FURMITY.—II.

½ lb. wheat, ½ lb. currants, ½ lb. raisins, ½ teaspoonful mixed spice, pinch of salt, sugar to taste, 1 quart of milk.

First boil wheat, currants and raisins in water separately, the wheat until the grains split, and the fruit until well plimmed, strain off all water. Boil one quart of milk and thicken with three tablespoonsfuls of flour mixed with water—now add all together and well stir.

* If not it may curdle.

This has been from olden times known as "The Unleavened Bread of Sincerity and Truth," and as such was partaken of on one day—set apart—in the year, and that Good Friday.

A BLACK MAN'S RECIPE TO DRESS RICE: 1861.

Wash him well, much wash in cold water, the rice flour make his stick. Water boil all ready very fast. Throw him in, rice can't burn, water shake him too much. Boil quarter of an hour or little more; rub one rice in thumb and finger, if all rub away him quite done. Put rice in colander, hot water run away; pour cup of cold water on him, put back rice in saucepan, keep covered near the fire, then rice all ready. Eat him up!

VEGETABLE SOUPS.

ENGLISH.--I.

Cut *very small* 1 carrot, 2 small turnips, 2 leeks, half a cabbage, head of celery, 1 potato (and any other vegetables to taste).

Put into *bubbling* water and boil hard for 20 minutes, add pepper, salt, beef or other dripping, olive oil or any other fat towards the end of the time.

Serve with fried croutons of toast or grated cheese.

POTAGE PAYSANNE--FRENCH VEGETABLE SOUP.—II.

Cook in a little "fat stock" 2 carrots, 2 potatoes, 1 turnip, cut very small, salt and pepper.

When these are cooked add the quantity of stock or water you consider necessary to complete the soup. Boil some minutes and serve into each plate in which you have some slices of good wheat bread.

"Fat stock" = water used for boiling beef, dumplings or ham, etc., just as it is without the fat removed.

BOUILLABAISSE—FISH SOUP.

Ingredients.--12 oz. of onions, 2 cloves stuck in the onions, 1 oz. parsley, 2 laurel leaves, 1 spray of thyme, 2 outer skins of a clove of garlic, 1 oz. of shallots, 2 oz. of carrots, 6 lb. of any kinds of fish, such as soles, whiting, barbel, plaice, etc., 4 oz. oil, ¾ oz. of salt, 1 pinch of pepper, ¾ oz. of allspice, 3½ pints of water, 1 teaspoonful of powdered saffron.

Mode.—Cut the fish into long pieces, or fillets, and place all the ingredients, except the saffron, in the saucepan in order as arranged above, cover the pan closely, and boil for 25 minutes. If whiting are cooked, they must be added after the other ingredients have boiled 15 minutes. Then remove the fish; drain carefully, and take off any particles that may adhere to them from the soup. Dress them high on a dish covered with a napkin. Strain the soup, add the saffron, pour into the tureen. Serve the fish at the same time as the soup, and serve fried bread, a third of an inch thick, separately.

Time.—1 hour. Average cost, 2s. per quart.

Seasonable at any time.

Sufficient for 6 persons.

NOTE.—Bouillabaisse can be made of fresh-water fish, but is not so delicious as when made with sea-fish. It is of southern

origin, and ought to be a highly-seasoned dish. This soup is well-known to all readers of Thackeray, by reason of his ballad wherein, visiting Paris when an old fogey, he recalls his remembrance of younger and more jovial days:—

"This Bouillabaisse a noble dish is,
A sort of soup, a broth, or brew,
A hotch-potch of all sorts of fishes,
That Greenwich never could outdo.
Green herbs, red peppers, mussels, saffern,
Soles, onions, garlic, roach and dace;
All these you eat at Terre's tavern,
In that one dish of Bouillabaisse."

Thackeray's Ballad of Bouillabaisse.

FROM AN OLD RECIPE PRINTED JULY, 1861.

A WINTER SALAD

Two large potatoes, passed through kitchen-sieve,
Unwonted softness to the salad give,
Of mordant mustard add a single spoon—
Distrust the condiment which bites so soon;
But deem it not, thou man of herbs, a fault,
To add a double quantity of salt;
Three times the spoon with oil of Lucca crown,
And once with vinegar procured from town.
True flavour needs it, and your poet begs,
The pounded yellow of two well-boiled eggs.
Let onion atoms lurk within the bowl,
And, scarce suspected, animate the whole;
And lastly on the favoured compound toss
A magic teaspoon of anchovy sauce:
Then, though green turtle fail, though venison's tough,
Serenely full, the epicure may say—
"Fate cannot harm me—I have dined to-day."